SCIENTIFIC AMERICAN

A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

Vol. XXI.---No. 18. [NEW SERIES.] NEW YORK, OCTOBER 30, 1869. $3 per Annum [IN ADVANCE.]

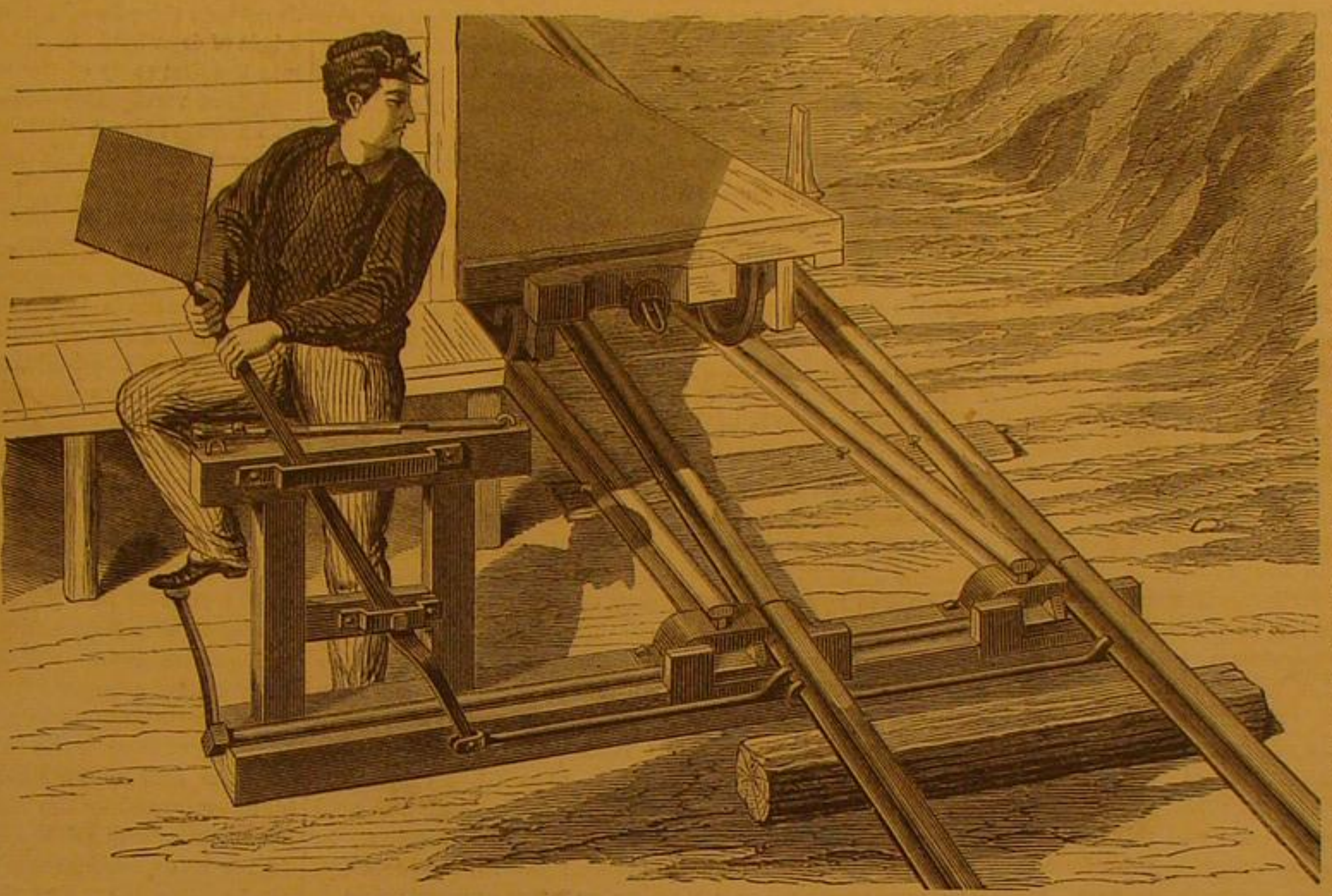
Improvement in Railroad Switches.

The essentials to a good switch are simplicity, durability, and security. All other considerations must be sacrificed to insure perfect safety. It is true that no form can be adopted that will render switch tenders careful, but there may be much question whether many of the misplacements of switches are not due to the flying over of switches, after they have been correctly placed by the tenders. As switches are now constructed, the tenders get the blame in all cases, right or wrong.

Our engravings exhibit the construction of a new kind of switch, differing in some features from anything else of the kind now in use. Everything about it is substantial, and when placed, nothing short of a man at the levers can change it.

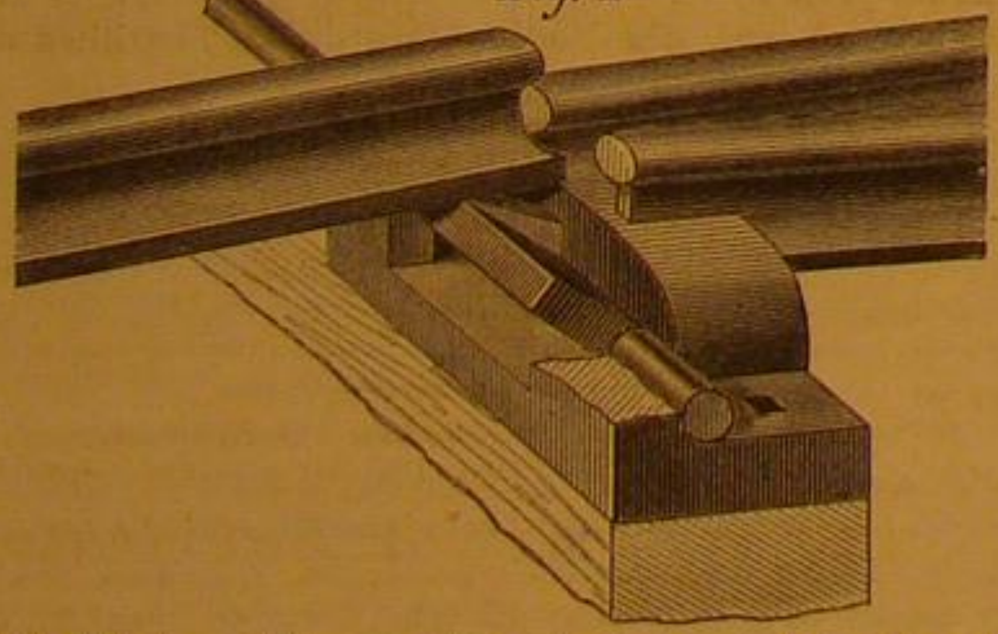
The movable rails receive their lateral motion through a lever of the ordinary kind, which may be held in place when not in use, by a hasp and lock, as heretofore.

The distinguishing feature of the switch is a rock shaft, shown in detail in Fig. 2, with angular projections underlying, and vertical angular projections rising up on either side of each of the movable rails. The rock shaft is operated by a lever upon which the switch tender places his foot, as shown in the larger engraving. When this lever is depressed, the angular projection upon which the rail rests is elevated as shown in Fig. 2. The rail is elevated with it, and released from the vertical angular projections which rise up at the side of the rail in the first position of the foot lever and rock shaft as shown in Fig. 1. The lateral movement being then made by the hand lever, the foot is removed, when the weight of the rail depresses the angular projection underlying the rail, and the latter drops down between the vertical angular projections above described, after which no lateral movement of the rail can take place until the foot lever is again depressed.



DOUGLASS' PATENT RAILROAD SWITCH.

Fig. 2



The flat form of the angular projection underlying the rail makes a perfect and solid foundation, and the side wear on the head of the rails is no more than in any other joint of the track.

We are informed this switch is now in use on the Delaware, Lackawanna, and Western Railroad, and is on trial upon several other important roads.

Patented through the Scientific American Patent Agency, Oct. 24, 1865, by George Douglass, who may be addressed for further information at Bridgeport, Conn., P. O. Box, 118.

THE FRENCH ATLANTIC TELEGRAPH.

From Chambers' Journal.

It is now nearly three years since it was our agreeable task to lay before our readers a description of the laying of the Atlantic Cable of 1866, and the recovery and completion of the lost cable of 1865. Since that time a great many telegraph cables have been laid; but none have been of so much importance, or possessed so many features of interest, as that just successfully completed between France and the United States. In the first place, it is interesting as being longer by about fifteen hundred miles, and laid in deeper water by five hundred fathoms, than any direct submarine line yet in existence; then its track lies through a part of the Atlantic which until very recently had been unexplored, and the nature of the bottom comparatively unknown; and thirdly, we look upon it with interest, because it shows that the importance of submarine telegraphic communication is commending itself to other countries besides our own. Hitherto, nearly all the more important submarine lines have been the direct offspring, and have remained in possession of English companies; but the present cable, although manufactured and laid by an English firm, is the result entirely of French enterprise, and to a large extent owes its existence to French capital.

The vital part of the longer section of the cable—or technically the "core"—is a copper conductor of seven wires twisted together, insulated by four concentric coatings of gutta-percha, separated from each other by an equal number of coatings of the material known as "Chatterton's compound"—exactly after the pattern of the cores in the last Atlantic cables—the only difference between them being in the weight of the conductor, which in the present case is four hundred pounds per mile, instead of three hundred pounds. This increase is to compensate for the additional length of the cable. Experiments have shown that the speed of signaling through submarine cables varies *inversely* according to their length, and *directly* as the weight of the conductor; so that, by adding to the weight in due proportion to the increased length, the speed obtained is the same as through a shorter cable.

The core is surrounded with a serving of yarn, called the "wet serving," allowing of the ready access of the water to the core. Until comparatively recently, this serving was saturated with tar, but experience showed that, should a slight defect occur in the gutta-percha, the tar from the serving being in itself an insulator would sufficiently stop it up to prevent its being discovered by the electrical tests, until perhaps it was too late to remedy it. The present wet serving, however, containing no insulating fluid, permits of the instant detection of a fault.

Around the serving are twisted spirally ten homogeneous iron wires galvanized, each of them embedded in five strands of Manila hemp. The cable thus completed is of a diameter of about one and a quarter inches, weighing about thirty-six hundredweight to the nautical mile, and capable of bearing a strain of seven tuns.

The core of the shorter section—St Pierre to Boston— is of the same description as that of the Brest to St Pierre section; but owing to its much shorter length, the weights of the copper conductor and insulator are only one hundred and seven pounds and one hundred and fifty pounds per mile respectively. This core is also covered with a wet serving, and then surrounded with about a dozen iron wires galvanized—the outside covering consisting of a silicated material, known as "Clark's compound;" the whole forming a cable of about one inch in diameter, weighing about two and three quarter tuns to the mile.

The Brest to St Pierre section was manufactured at the Telegraph Construction Company's Works at Greenwich, and transmitted piece by piece in old hulks to the *Great Eastern* steamship, lying off Sheerness. This section is of three kinds, namely: 1. The heavy shore-ends for protection against ships' anchors, tides, etc., weighing 360 hundredweight per mile. 2. The "intermediate," of a size between the shore-end and the deep-sea portion, 127 hundredweight per mile. 3. The deep-sea portion already described.

The whole of the above, 2788 knots in length, with the exception of 15½ miles of shore-end, and twenty miles of intermediate, was taken to the *Great Eastern*. We calculate that if the various component parts of it were laid end to end, they would make a chain of over 192,000 miles in extent, or nearly eight times the circumference of the globe. The whole of the work, including the manufacture of the two sections, and the fitting out of the *Great Eastern*, occupied little more than eight months.

For the accommodation of the cable on board the *Great Eastern*, three gigantic tanks were constructed, situated in the center, stern, and fore part of the ship, and known as the main, after, and fore tanks, respectively. Their diameters were as follows: Fore, 51 feet 6 inches diameter, by 20 feet 6 inches deep; main, 75 feet diameter, by 16 feet 6 inches deep; after, 58 feet diameter, by 20 feet 6 inches deep; with a total capacity of 169,760 cubic feet—being 27,750 feet greater than the capacity of the tanks in 1866. These immense structures were fixed to the sides of the ship, and supported by about 30,000 cubic feet of timber. The weight contained in them was about 5520 tuns, distributed as follows: Fore, 1270 tuns; main, 2580 tuns; aft, 1670 tuns; total, 5520 tuns.

The cable paying-out apparatus, consisting of an elaborate series of break-wheels and stoppers, with the measuring-machine, and the "dynamometer," a machine for constantly recording the strain on the cable, contained all the improvements that science and experience have suggested. The dynamometer especially claims our notice, as being, to our mind, one of the most ingenious and useful contrivances connected with the apparatus. It is placed between the stern of the ship and the paying-out breaks, and consists of a vertical frame-work of iron, in the center of which is fitted a grooved wheel, for the cable to pass under as it runs out over the stern of the ship. The wheel is made to slide up and down the frame as the strain on the cable varies, or, in other words, as the cable becomes tighter between the stern and the breaks. At the side of the machine is a scale, with the calculated strains in hundredweights marked upon it; and a hand fixed to the sliding-wheel traverses this scale, and indicates at any moment the strain on the cable. From the indicated strain, of course, the depth of water may be judged, and the breaks arranged accordingly; but the dynamometer is of most service in cases of hauling back the cable.

The ship was also fitted with a powerful set of picking-up machines and tackle, together with buoys, buoy-ropes, mushroom anchors, and everything requisite for picking up the cable in case of a breakage, as in 1865.

We must not forget to mention that the ship was also fitted with a complete set of "Wier's Pneumatic Signals," such as we believe are in use on several of the Cunard steamers. The uses to which this excellent apparatus is put are as numerous as they are effectual. The apparatus is rather complicated in its details, but simple enough in the principle on which it works. By pressing down a lever on a series of chambers of compressed air, the air from the latter is forced along a very small leaden pipe, producing instantaneously at the distant end some mechanical effect—either ringing a bell, or moving a hand, or lifting up a small flap, under which is written the signal meant to be observed. On the *Great Eastern* there were—1. An apparatus at both ends of the ship for communicating various messages to both screw and paddle engines; 2. An apparatus at each of the three cable tanks for signaling to screw and paddle to stop and reverse, in case of a hitch or foul-flake in the tank; 3. An apparatus connected, by means of cams, with the shafts of the screw and paddle engines, registering the revolutions of the same on a clock placed in the engineer's office; and 4. A communication was placed between the bows and the steering-wheel, to be used in case picking up should become necessary. Connected with some of the apparatus was also a tell-tale, which by an automatic action would indicate whether the order sent had been obeyed or not.

We have given so lengthy a description of this pneumatic apparatus, because we believe it to be one of the most useful inventions in the signaling department yet made. If properly fixed, it is almost impossible for it to get out of order.

With reference to the ship itself: so much has been said about the *Great Eastern*, that we do not wish to trespass upon our readers' patience with any long discourse upon the subject; but still the ship remains one of the wonders of the world, and we cannot pass on without some slight reference to its astonishing size and capabilities.

The increased size of the cable tanks has taken away considerably from the convenience and appearance of the cabin and saloon accommodation, but still the cabins more resemble rooms in a hotel than what we usually understand by ships' berths; and the saloons, especially the grand saloon, are still far beyond our ideas as to the size of any rooms to be found on board a ship. In fact, the ship more resembles a floating town than anything else we can think of. On what other ship can one find full-sized premises for butchers, bakers, plumbers, carpenters, blacksmiths, and fitters, with saw-mills, roperies, farm-yards, sheep-pens, pig sties, and store-rooms big enough to contain stores for a small army? It cannot be doubted that for anything else besides cable-laying, the *Great Eastern* is *too* big. The expenses of keeping her in trim, and her daily expenses while at sea, are such that no ordinary number of passengers would, at the usual fares, make her pay. But for cable-laying, she is the ship *par excellence;* and we doubt very much whether either of the present Atlantic cables would have been laid but for her size and general adaptability to the purpose. In the first place, no other ship could have taken the entire cable on board, thus obviating all the risks attendant upon changing from one ship to another in mid-ocean, as was done with so much danger with the first cable, in 1858. In the second place, her behavior at sea fits her better than any other ship in existence for cable-laying. She rolls to perfection when she has a heavy "swell" to encounter, but all her movements are of so regular and easy a character, that, in even heavy gales, the operation of cable-laying can proceed without any interruption whatever.

THE MANUFACTURE OF SULPHURIC ACID.

From the Report of J. Lawrence Smith, United States Commissioner to Paris Exposition.

Sulphur from Coal Gas.—In the manufacture of gas from coal, sulphide of hydrogen is one of the products from which the gas must be purified; and, for several years, what is known as the oxide of iron process has been adopted in large towns. This process consists in passing the gas through layers of peroxide of iron, mixed with some inert material to give it the necessary mechanical subdivision. The peroxide of iron is reduced to protoxide of iron, and the sulphur is precipitated in the mass, remaining uncombined. Exposure to air reconverts the protoxide into peroxide of iron without altering the sulphur contained in it; and this revived peroxide is used a second, third, and fourth time, in fact until the accumulated sulphur interferes with its rapid action, when it is replaced by fresh material. After repeated use this oxide of iron often contains as much as 40 per cent of sulphur. Some sulphuric acid factories employ this residue thus charged with free sulphur, and manufacture sulphuric acid from it after certain cyanides are extracted from it by other factories. The amount of sulphur that could be thus furnished annually is very great, estimating the sulphur in coal as one per cent, when its average is actually much greater. In London and its suburbs alone the gas produced annually would furnish 15,000 tuns, equal to 30,000 tuns of sulphuric acid. M. Lawes, near London, uses 2,180 tuns of this residue, each tun furnishing one and a quarter tuns of sulphuric acid.

Sulphur from California.—To the northeast of Borax Lake, in California, and about one mile from it on the borders of Clear Lake, is a large deposit of sulphur, where solfatric action is still apparent. The amount of sulphur which has been deposited in this place is very large, covering an area of several acres, and extending to a depth not yet ascertained. From six to eight tuns of this sulphur are refined daily, and are used in the manufacture of sulphuric acid, gunpowder, etc. A small quantity of cinnabar is associated with this sulphur. There is another large deposit two miles from this locality, at Chalk Mountain, and still another at Sulphur Springs further east; but neither of them contains cinnabar. These and other localities of sulphur in California were represented in the collection sent from California by the Commissioner.

Pyrites.—The manufacture of sulphuric acid from pyrites is probably the most important improvement made in manufacturing chemistry since the production of carbonate of soda from sulphate of soda, by Leblanc; and although it has been in operation for many years, it is instructive to review it in connection, together with the development of industrial chemistry in the past few years; for hardly fifteen or twenty years have elapsed since all sulphuric acid was manufactured from Sicilian sulphur, with but one or two insignificant exceptions, while now there is not more than one tenth of this acid made directly from sulphur.

While the use of iron pyrites in the manufacture of sulphuric acid dates back prior to 1830, it was not until 1838 that the short-sighted policy of the King of Naples, granting the monopoly of Sicilian sulphur to Messrs. Taix & Co., of Marseilles, that its use was fairly established, for the price of sulphur rose in England from $25 to $70 a tun, and in twelve months from that time, in England alone, not less than fifteen patents were granted for the manufacture of sulphuric acid from pyrites. And although the monopoly was soon withdrawn, by the persuasion of English vessels of war and the diplomacy of other governments, the pyrites had secured a firm footing in supplanting sulphur in the manufacture of sulphuric acid; and since then its use has rapidly increased; giving a wholesome lesson to governments to exercise great caution in granting monopolies and in legislating so as not to thwart industries based upon a science that draws colors rivaling the tints of the rainbow from coal, and that is not to be confined in the manner and method of its creations so long as the elements in one shape or another are at its command.

Since the first production of sulphuric acid from pyrites the establishment at Fahlun, in Sweden, has employed this process altogether, pyrites being very abundant in that locality. This example was followed by Perret, of Chessy, France, where the pyrites contains from three to four per cent of copper, which metal can only be extracted by desulphurizing the ore. From the mines of this locality 70,000 tuns of pyrites are burnt and exported annually, and the various lead chambers here for making sulphuric acid have a capacity of about 1,600,000 cubic feet. This process is carried on in all parts of France, whether the pyrites contains copper or not, and Sicilian sulphur is only employed for special purposes in France and England.

In the middle of France the pyrites of d'Alais is principally employed, it being very abundant. In the North of France the Belgian pyrites is used. In England the Irish pyrites is sometimes employed, although containing not more than 30 per cent of sulphur; but most of the manufacturers use the pyrites coming from Huelva, in Portugal, containing 45 to 50 per cent of sulphur, where the deposits of pyrites are remarkable for their great extent, extending into Andalusia, in Spain.

One of the mines that is worked in the province of Alemtejo, in Portugal, has a deposit of massive pyrites nearly a half mile long by two hundred and fifty feet across the widest part, and contains from two and a half to four per cent of copper.

Pyrites is frequently arsenical, and as the sulphuric acid produced from it contains arsenious acid, it is unfit for many purposes, especially where it is employed in the manufacture of products of domestic economy, such as acetic, citric, and tartaric acids, and also in some of the industrial arts, and in cleansing the surface of metals for alloying them with tin or other metal. In these cases acid made from sulphur is to be used, or the pyrites acid is to be purified by means of sulphide of barium or by sulphide of hydrogen, when the acid thus treated is equal in purity to any other.

It is not to be supposed, however, that sulphur is henceforth to be excluded from the manufacture of sulphuric acid; on the contrary, it is more than probable that many factories will return to its use, as the sulphur in Sicily is almost exhaustless, and if ever the country becomes opened to the world by good and numerous roads, the price of sulphur must diminish; and the diminution required is very small to bring it again into more common use among the acid manufacturers of the world. The factories in Belgium, in the North of France, and some in other parts of that country, those in Germany, and a number in England, will find it profitable in almost any state of the case to continue the use of pyrites.

(To be continued.)

THE NIAGARA ELEVATOR AT BUFFALO.

A great deal of engineering skill has been displayed in the erection of the giant elevators now in operation in various parts of the country, and our readers will probably be interested in some items respecting the Niagara elevator at Buffalo, which we cull from a letter of one of the correspondents of the New York *Tribune*.

"This, although the largest, is only one of 25 others which line the river upon both sides for a mile from the harbor's mouth. Buffalo has often been called "the world's granary;" a view of these elevators at work proves it. But a few years ago all the grain was handled in the bushel measure; many will be glad to learn how it is handled now. I propose to give as minute a description of one of the great elevators by which this is accomplished as my memory will enable me. The produce of the great West is so enormous that it requires enormous steam power to handle the millions of bushels of grain which are passing through this port.

"After several destructive fires, which consumed vast amounts of grain, a party of gentlemen determined to build an elevator that should be fire proof; the Niagara was the result. It is almost wholly composed of stone, brick, and iron, inside and out. The tall structure upon all elevators known as the "tower" is extremely liable to take fire, on account of the accumulation of dust, which is dry and highly inflammable. This tower has eight iron floors, reached by an iron, spiral stairway. The side walls are without openings. The foundations are stone and brick; the superstructure iron. The main building is 125 by 130 feet, the walls resting upon piles driven to the solid rock. The bins, which contain an enormous weight when full, rest upon independent foundations. There are 132 solid cut stone piers, each upon nine piles. Upon each pier are three solid oak timbers, braced together, which support the floor of the bins 20 feet above the pavement. This gives room for spouting the grain from any one of the 144 bins, upon endless-belt grain-carriers, to the bottom of elevators, which raise it to the top of the building, whence it flows by its own gravity into boats or cars or other bins. Grain keeps best in wood, so the bins are made of planks six to ten inches wide, laid up like a block-house, flat-wise. The center bins are 73 feet deep, and those under the lowest part of the roof, 52 feet. An iron ladder is built into one corner of each to enable a man to examine the grain or sweep out the dust when empty, or for any other purpose. The valves for discharging the grain are plainly marked by registered numbers, and are opened or shut in the lower story, information being conveyed by speaking tubes throughout the building to those in charge of the various departments. The boiler and engine which set in motion the ponderous machinery are in a separate, fire-proof building, away from any danger from sparks. Some of the grain is shamefully dirty—a disgrace to the growers. Sometimes the owners of such grain contract to have it run through the cleaner, with which every perfect elevator is furnished. In this one the dirt is driven by a powerful blast through a sheet iron pipe, two feet in diameter, and discharged into the river. Tuns of a good manurial substance and some grain are thus wasted, though many weed seeds are got rid of. There should be a law requiring all grain passed through a public elevator to be passed through the cleaner, if not already clean, before being offered for sale.

"Now let us suppose that a vessel full of grain has arrived. The steamer upon which I am now sailing up Lake Erie, the Dean Richmond, is capable of carrying 38,000 bushels of wheat. Imagine, if you can, the labor of transferring such a cargo, by the old process, with pails, tubs, half bushel measures, bags, hands, shoulders, carts, and horses. Now, as soon as the hatches are off a signal is given to the engineer, and directly the machinery of the tower begins to rumble, and a ponderous iron case rises, until high enough to swing its foot out over the hatchway. Another signal, and down it drops into the pile of grain. This is the "leg," and contains a belt of iron buckets which scoop up the grain and carry it into the first story of the tower. There it is poured into the hopper of a weighing machine, gaged exactly for 100 bushels. The moment the scale turns a man in charge stops the supply and opens a valve at the bottom, which lets out the grain while he is making his score; it should be self-registering—perhaps it is. Then he closes the lower valve, and opens the upper, repeating the operation so often that 7,000 bushels an hour are thus weighed. As fast as it falls from the scale hopper it is taken up by another elevating belt, and emptied into a receiver at the top of the tower, whence it runs to any part of the building. If it has to be cleaned it is reweighed and loss charged, as well as a small charge for cleaning. The quantity, quality, and owner's name of the wheat in each bin is registered, the elevator proprietors being responsible for the contents. The grain is sold by sample, but can be readily inspected and quantity ascertained by visiting the bins. If the grain heats it is immediately transferred to other bins, the operation giving it a thorough airing. As the floor of the bins is 20 feet above the ground, it will readily be seen how easily canal boats or cars can be loaded, while the unloading and elevating go on simultaneously.

"Suppose a cargo of wet grain arrives at this elevator. The same machinery is applied to its discharge, but instead of being stowed in the bins or shifted about to dry it in the air, it is sent into a spout which conducts it into another building owned by the same company, and built for a model malt house, with all the modern improvements. Here upon drying kilns, each 50 feet square, 15,000 bushels of wet grain can be dried daily. At the time of my visit the kilns were all in full blast with a cargo of oats from a sunken canal boat, and I wondered whether his damaged grain, when dry, would be put upon the market as sound. On being 'kiln dried,' will the oats be ground for human food? Or, having their vitality thus destroyed, if sold cheap, will they be, like other trash, mixed with 'Norway oats' and sold as pure improved seed? This malt house is 212 feet long and 54 feet wide, of solid blue limestone, with slate roof, iron gutters, and fire-proof floors, where the barley is sprouted, after having been steeped, 500 bushels at a charge. The kilns are heated by anthracite fires in the basement, and the flues are conducted up to and form the bottom of the kilns, which are of perforated iron, so that all the air or gas of the furnace may pass out through the grain. The finished malt or dried grain can be delivered directly from the store rooms of the malt house to the cars which run between the building and the elevator."

The Woolwich Dockyard Abandoned.

This celebrated dockyard, nine miles southeast of London, which has been in operation as government works for over three hundred years, has been closed, and will either be sold or leased to private shipbuilders. This dockyard, at the lowest estimate is worth $5,000,000, and if leased at 2½ per cent on this valuation, would yield a rent of $125,000.

The town of Woolwich has a population of over 40,000 souls, and owes its prosperity to the government establishments. In addition to the dockyard, which is one mile in length, separating the town from the Thames, it is the site of the largest arsenal in Great Britain, which covers more than 100 acres, and contains 24,000 pieces of ordnance and a vast amount of warlike material. Woolwich is also the headquarters of the Royal Horse and Foot Artillery and Corps of Sappers and Miners, for the accommodation of which extensive barracks have been built and parade grounds prepared. It is also the seat of a Government Military Academy for engineering and artillery.

In consequence of the increasing shallowness of the Thames, the Woolwich dockyard has been used for the construction of steamers and the lighter class of vessels, and for the above reason the establishment is now closed. When in full operation, the dockyards employed two thousand workmen, and great apprehensions of distress and inconvenience were entertained in case this large number of men should be discharged at once. However, the force was gradually reduced, and when the works were finally closed, only two hundred men were at work. The removal has caused many dwelling houses in the town to become empty, and the business of the tradesmen has been seriously affected.

The first ship built at Woolwich was the *Henri Grace de Dieu*, named after Henry VIII. Subsequently, in 1637, the *Sovereign of the Seas*, carrying 167 guns, and the largest ship of war then known, was built at this yard, and in 1751 the *Royal George*, which foundered at her anchorage at Spithead.

SOME EXPERIMENTS WITH THE GREAT INDUCTION COIL AT THE ROYAL POLYTECHNIC.

BY JOHN HENRY PEPPER, F.C.S., ASSOC. INST. C. E.

THE LARGE INDUCTION COIL.

We extract from the *Chemical News* the following abstract of a paper communicated to the Royal Society, by J. P. Gassiot, F.R.S.:

"The length of the coil from end to end is 9 feet 10 inches, and the diameter 2 feet; the whole is cased in ebonite; it stands on two strong pillars covered with ebonite, the feet of the pillars being of a diameter of 22 inches. The ebonite tubes, etc., are the largest ever constructed by the Silver Town Works.

"The total weight of the great coil is 15 cwts., that of the ebonite alone being 477 lbs.

"The primary wire is made of copper of the highest conductivity and weighs 145 lbs.; the diameter of this wire is 0·0925 of an inch, and the length 3 770 yards. The number of revolutions of the primary wire round the core of soft iron is 6,000, its arrangement being 3, 6, and 12 strands.

"The total resistance of the primary is 2·201400 British Association units, and the resistance of the primary conductors are respectively—for three strands, 0·733800 British Association units; six, 0.366945 B.A.U.; twelve, 0·1834725 B.A.U.

"The primary core consists of extremely soft straight iron wires 5 feet in length, and each wire is 0·0625 of an inch in diameter. The diameter of the combined wires is 4 inches, and the weight of the core is 123 lbs.

"The secondary wire is 150 miles in length; it is covered with silk throughout, and the average diameter is 0·015 of an inch.

"The total weight of this wire is 606 lbs., and the resistance is 33·560 B.A. units. The length of the secondary coil is 55 inches, and the insulation throughout is calculated to be 95 per cent beyond that required. The secondary wire is insulated from the primary by means of an ebonite tube of ½ an inch in thickness and 8 feet in length.

"The length of the secondary coil is 54 inches, the diameter is 19 inches, and without the internal ebonite tube containing the primary wire and iron core it is a cylinder 19 inches in diameter and 6 inches thick.

"The condenser, made in the usual manner with sheets of varnished paper and tinfoil, is arranged in six parts, each containg 125 superficial feet, or 750 square feet of tinfoil in the whole.

"A large and substantially made contact breaker, detached from the great coil and worked by an independent electro magnet, was constructed, and worked very well with a comparatively moderate power of 10 or 20 large Bunsen's cells, when, however, the battery was increased to 30 or 40 cells, it became unmanageable.

"A Foucault break, with the platinum amalgam and alcohol above it, was now tried, and answered very much better than the ordinary contact breaker; there was no longer any burning or destruction of the contact points, although the great power of the instrument appeared to cause continued decomposition in the water of the alcohol placed above the platinum amalgam; and every now and then the spirit was violently ejected, probably by explosion of the mixed gases taking place in the amalgam, in which they collected in bubbles; the alcohol took fire constantly and had to be extinguished. A large and very strong glass vessel (in fact, an inverted glass cell belonging to a bichromate battery) was bored through, and the neck fitted into a cap with cement, a thick wire covered with platinum being inserted in the bottom; the platinum amalgam was poured on this, and over it a pint or more of alcohol; the contract wire was also very thick and pointed with a thick stud of platinum, and, being attached to a spring, contact was easily made and broken. Explosions did not occur, flashes of light could be seen between the amalgam and the alcohol, and the hight of the column of the latter prevented the forcible ejection of the spirit, which no longer took fire. The break was used for eight hours in a continuous series of experiments.

"The Bunsen's battery used in the experiments was made with the largest porous cells that could be obtained, and each cell contained about one pint of nitric acid

"Some experiments were tried with the battery arranged for intensity, and used with the complete condenser of 750 square feet of tinfoil and 1,500 square feet of paper. At first five cells were used, and these gave a spark 12 inches in length. The number of cells were gradually increased until 50 were in operation, when a spark from 28 to 29 inches in length was obtained.

"In order to ascertain whether any variation in the size of the condenser would affect the length of the spark, a number of experiments were tried; and it was found that when half the condenser was used the spark increased in length up to 20 cells, but not after.

"Experiments were now tried to ascertain whether any increase in the length of the spark could be obtained by arranging the battery and the primary coil for quantity, but no material a dvantage was obtained by this arrangement; even where three groups of cells were connected a decrease in the length of the spark is observed when compared with the 45 or 50 cells arranged for intensity, the dfference being as 20 to 28

"The spark obtained from the large coil is thick and flame-like in its appearance, and therefore it will be alluded to as the 'flaming spark.'

"When the discharging point and circular plate are brought within 6 or 7 inches of each other, the flaming nature of the spark becomes still more apparent.

"Two light yellow flames curving upwards appear to connect the opposite poles. If a blast of air from a powerful bellows is directed against a flaming spark, the flaming portion can be blown away and increased in area, and thin wiry sparks are now seen darting through it, sometimes in one continuous stream, at another time divided into three or more sparks, all following the direction in which the flame is blown.

"The flaming spark is very hot, and if passed through asbestos (supported on an insulating pillar), quickly causes the latter to become red hot.

"When powdered charcoal is shaken from a pepper box into the flaming spark in a vertical line and in considerable quantities, the greater part of the light is obscured, and the whole form of the flaming spark presents the appearance of a black cloud with a line of brightly ignited particles fringing the bottom parts. If the charcoal is dusted through in small quantities, each particle becomes ignited, like blowing charcoal into a hydrogen flame

"When the flaming spark is directed on to a glass plate upon which a little solution of lithium chloride is placed, the latter colors the flame upwards to the hight of 3 or 4 inches in the most beautiful manner; and if the point of the discharge is tipped with paper, or sponge moistened with a little solution of sodium chloride, the two colors (the yellow from the salt, and the crimson from the lithium) meet each other, a neutral point being found about half way, and thus illustrating apparently the dual character of electricity, and that + passes to — electrical, and *vice versa*.

"The flaming spark can be obtained in perfectly dry air.

"While passing through common air, if blown against a sheet of damp litmus paper, the latter is rapidly changed red. In order to ascertain whether the acid product was nitric acid, the flaming spark (9 or 10 inches in length) was passed through a tube connected by a cork and bent tube with a bottle containing distilled water, from which another tube passed to the air pump; on drawing the air slowly over the spark, and passing the former into the bottle, nitric acid was obtained in large quantities, so much so that it could be detected by the smell and taste as well as by the ordinary tests. The popular notion that nitric acid is always produced during a thunder storm would therefore appear to be correct. To determine the effect of a cooling surface on the flaming spark, a hole 1½ inches in diameter was bored through a thick block of Wenham Lake ice, and the spark passed through the air in the tube of ice; no change took place, and the spark was still a flaming one.

"When the spark was received on the ice, it lost its flaming character, and became thin and wiry, spreading out in all directions.

"If the discharging wires were tipped with ice, the spark was always flaming when any thickness of air intervened between them. Even over the ice, if the spark passed a fraction of an inch above the surface, it was always a flaming one, but changed to the thin spark when the point of the discharging wire was thrust into the ice.

"If one of the discharging wires of the great coil is brought to the center of a large swing looking-glass and the other wire connected with the amalgam at the back, the sparks are thin and wiry, arborescent, and very bright; the crackling noise of these discharges being quite different from that of the heavy thud or blow delivered by the flaming spark.

"When the discharging wire is brought close to the flame of the looking-glass, or if a sufficient thickness of air intervenes, the spark again becomes flaming; or, as sometimes occurs, if the discharging wire is placed about 5 inches from the frame, the spark is partly flaming and partly wiry, *i. e.*, when it impinges on the glass.

"The spectrum is a continuous one with the sodium line.

"When the blast of air is used, and the wiry sparks made apparent, then the nitrogen line appears.

"The flaming spark has been ascribed by some experienced observers to the incandescence of the dust in the air, and especially sodium chloride

"To ascertain whether the 'flaming spark' could be obtained with a small number of cells, the large Bunsen's battery was reduced to three cells, and it was found that no appreciable spark could be produced when the whole primary wire was used with less than five cells.

"By reducing the length of the primary wire, and using the four divisions separately, with five cells the spark was wiry, and varied from 4½ to 6½ inches; with 10 cells it was wiry, and varied from 8½ to 9¾; in the latter the spark was slightly flaming. With fifteen cells the spark was slightly flaming, and varied from 10 inches to 11⅝ inches. With twenty cells a flaming spark varying from 11¼ inches to 12½ inches was obtained.

"When the two wires from the secondary coil are placed in water, no spark is perceptible, even when the wire was brought very close together, until they touch.

"If the negative wire is passed through a cork, on which a glass tube (a lamp glass) is fixed containing a depth of 5 inches of water, and the positive wire is brought within half an inch of the surface of the water in the tube, it becomes red hot, and if drawn further away from the surface the upper part of the tube is filled with a peculiar glow or light abounding in Stokes' rays.

"The experiments with the vacuum tube, and especially Gassiot's cascade, are, as might be expected, very beautiful. When a coal gas vacuum tube of considerable diameter, and conveying the full discharge from the secondary coil, is supported over a powerful electro-magnet axially, the discharge is condensed and heat is produced.

"If placed equatorially, the heat increases greatly, and when the discharge is condensed and impinges upon the sides of the glass tube, it becomes too hot to touch, and if the experiment was continued too long the tube would crack.

"The enormous quantity of electricity of high tension which the coil evolves, when connected with a battery of forty cells, is shown by the rapidity with which it will charge a Leyden battery.

"Under favorable circumstances, three contacts with the mercurial break will charge 40 square feet of glass.

"On one occasion a series of twelve large Leyden jars arranged in cascade were discharged; the noise was great; and each time the spark (which was very condensed and brilliant) struck the metallic disk, the latter emitted a ringing sound, as if it had received a sharp blow from a small hammer.

"The discharges were made from a point to a metallic disk; and when the former was positive the dense spark measured from 18½ to 18¾ inches, and fell to 2½ inches when the metallic plate was positive and the point negative.

"Variations of the Lyden-jar experiments were tried by connecting the coil worked by a quantity battery of 25 + 25 cells with six Leyden jars arranged in cascade, and the spark obtained measured 8½ inches.

"The same six jars connected with the coil, when the fifty cells were arranged continuously for intensity, gave a spark of 12 inches of very great density and brilliancy.

Earthquake-Proof Buildings.

The recurrence of earthquake shocks in California has led to a discussion of the methods of building houses in such a manner as to be virtually earthquake-proof. A San Francisco architect, Mr. Saeltzer, has read a paper on this subject before the California Institute of Architecture, in which he contends that flexible materials only should be used in building. His theory is as follows:

"By distributing the whole weight of the building on piers of stone, brick, or iron, or on wooden piles—in fact, isolating the foundation in such a manner that these piers or piles form part of the foundation — and by connecting them with iron beams screw-bolted together, the building is then well anchored at the proper place; in fact, this style of foundation will form a girding all round the building longitudinally and transversely.

"This mode of construction will insure, first of all, the least contact with the earth; secondly, concentration of the whole mass of the building on single points only with strong anchorage; thirdly, more elasticity of the foundation, and consequently more elasticity in the whole mass of the building; fourthly, a combination of heterogeneous materials in one mass—an amalgamation—one of the most important points to be gained; fifthly, this style of building is the cheapest of all, and in most cases applies to our wants and climate, and to the desired architectural arrangements, and is applicable to any material."

* * * "The advantage of the concentration of the whole mass on piers will at once be visible. A pier has more elasticity than a solid wall, and if placed isolated, in the proportion of about eight times the hight to its base, this pier would, by a slight movement of the earth, lose its point of gravity; but by connecting a number of piers horizontally, traversely, and longitudinally, and by resting the weight of the whole building upon them, they become restrained in their natural action till the whole mass of the building begins to move.

"That piers will facilitate the rapidity or velocity of the movement of the whole mass, nobody will deny; inasmuch as they stand isolated, are comparatively weaker than a solid wall, and have solely to depend on themselves, in their own strength and nature, without any assistance from a connecting wall. It is hardly necessary to mention that the piers should, of course, be in proportion to the weight they have to support, and should be placed at proper distances for security."

* * * "To many it may seem strange that the towers of San Francisco stood so well during the late earthquakes, with hardly any apparent damage, and that also in European cities the towers have also been less injured; a fact which proves, in a most striking manner, that the flexibility or elasticity of a mass is a necessity for safety. A tower is a pier of high proportion, and forms a high pendulum, and naturally swings with more rapidity than a longer mass, and hence there is less danger. The tower of the Doin of Erfurt, at present a fortified city in Prussia, contains the largest bell in the world except the celebrated bell in Moscow. This bell requires twenty-four men to set it in motion, and when in motion has always caused an oscillation of the tower varying from four to five feet from the perpendicular line. For centuries this bell has been used, and the tower remains as perfect as ever. This tower is built of cut stone, with the finest details of Gothic architecture. I merely give this example to show the flexibility even of stone, provided the proportions are right.

"All our hotels stood well, also a large number of stores; in fact all buildings supported on piers or columns. All the bodies of churches also stood well, especially where buttresses were introduced. Each buttress forms a pier, and has, consequently more elasticity, and always will stand well, provided the proportions are artistically carried out. Very low churches, built more in the proportions of a stable, are unsafe; in fact, all buildings one story high and of considerable extent are liable to danger, more so than two or three-story buildings, no matter of what materials soever."

Floating Telegraph Station and Lightship.

We gave on page 36, Vol. XVII., a description with illustrations of floating batteries, buoys, and lifeboats, invented by Capt. John Moody, late Managing Director of the Goole Steam-Shipping Company.

We now present to the consideration of our readers an improvement on the form of the lightship, an engraving of which was given in the article referred to.

The great difficulty to be overcome in the perfection of this invention was to obtain a suitable vessel capable of being moored in any sea however tumultuous, and to obviate the continuous rolling motion of the lightships hitherto used, the great essential in a floating telegraph station being buoyancy with stability and constant steadiness, which a sharp vessel cannot give.

The vessel is constructed with four equal rays or projections proceeding from a central circular deck protected by iron bulwarks, sloping outward at the top. Proper openings are made through the deck to the interior of the vessel for companions and skylights, as well as good large scupper holes round the bulwarks to take off all water from the deck, so that even if it were possible for this part of the vessel to fill with water it would all run out through the scuppers; nor would there be any danger of foundering, owing to the great buoyancy of the vessel, her clearing valves, and her division into numerous water-tight compartments and other internal contrivances.

The vessel is also constructed to deflect the waves as they strike, instead of allowing them to break upon deck, as in the ordinary form of vessel.

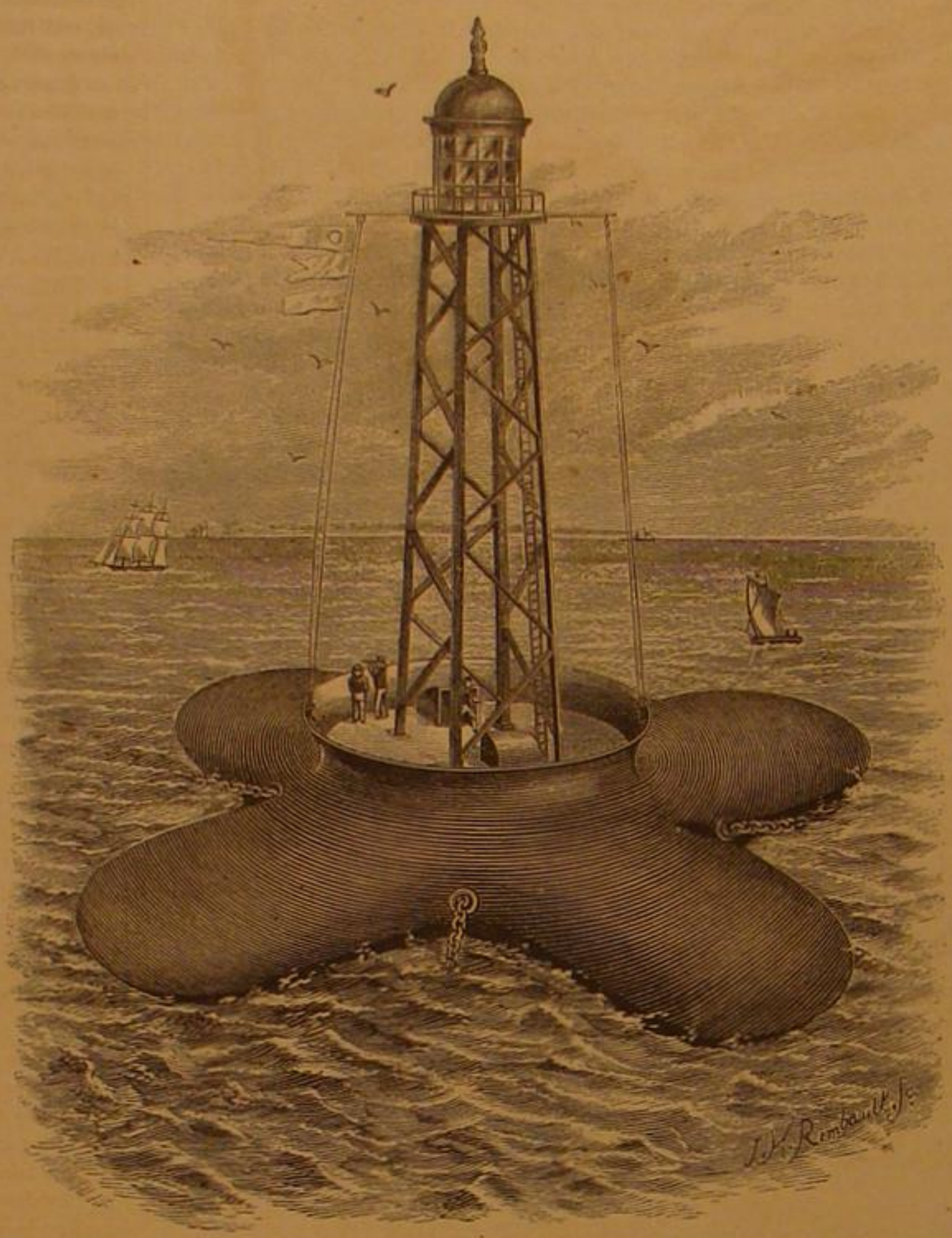
It is proposed by the inventor to use these vessels as intermediate telegraph stations where long submarine cables are laid. For example, he would, in establishing an Atlantic cable, carry it in comparatively short lengths, placing one of these vessels somewhere in mid-channel with a cable from Land's End. The next vessel would be placed off the Western Islands, or Hebrides, and the third off the American coast, from which a cable would be carried direct to New York.

By this means the cable would be divided into shorter lengths without increasing its aggregate length, and it is claimed the following advantages would be secured:

1. The diameter and weight of the cable would be considerably lessened, thereby diminishing its cost.

2. These shorter lengths could be carried out and laid by a smaller steamer than that employed in laying the present cables, thus very considerably reducing the cost of laying them.

3. These shorter cables, should they break, could be repaired or replaced with new lengths in a much shorter time, with much less labor, and at a greatly diminished risk and cost than in the case of a cable stretching from shore to shore.



FLOATING ELECTRIC TELEGRAPH STATION AND LIGHTSHIP.

Capt. Moody claims that even supposing that the cable laid in lengths was only intended to be used at its shore ends for through messages, such a plan would possess the advantages enumerated; but he claims numerous other advantages for this system.

Among these later advantages are the following:

Ships could call, and masters could communicate with their owners, whether in England, France, or the Continent, on that side the cable, or in America on this side. Masters on a trading voyage, and a long time out, would thus be enabled to send home letters and papers giving full information of the results of their voyages; for these mid-ocean stations could be made available for post-offices as well as telegraph stations. Arrangements could be made with the mail steamers to call for letters and anything else that might be left at the stations.

By means of these stations, money and bills could be transmitted from masters to owners.

Large quantities of all kinds of stores and provisions could also be kept there for sale to passing ships, and to relieve shipwrecked people who might be picked up, or who in open boats had succeeded in gaining the station.

News of wrecks or disasters at sea could be sent through the cable, and assistance might be obtained for many a ship which otherwise would be lost. Lifeboats should be kept at these stations (built upon the same principle as the telegraph ships, somewhat modified—that is, with four rays or arms, which would render them free from liability to upset), for the purpose of saving life, rendering salvage services, and as a means of communication with passing ships; so that all these floating stations would thus become not only places of business, but places of refuge in the very midst of the ocean. These stations could be boarded in all weather, for from their peculiar form they could always be approached on the lee side, where the sea would be much broken, and perfect safety in boarding secured.

In fact these stations might be made the centers of communication between all nations by a simple system of cross cables; as, for example, in a cable between Europe and America, the first or mid-channel station might have short cross cables to England and France, the next station, placed off the Western Islands, could have a short cable carried to the principal island in the group, putting it in communication with America, England, France, and the whole Continent of Europe; and what could be done in that case in that ocean, could be done in all other cases, and in all other oceans and seas, until the whole world became connected together.

"FAST" METHODS OF TELEGRAPHY.

We herewith give, as promised, an extract from the Report of the President of the Western Union Telegraph Company, on the subject of "fast" telegraphy. It has a certain historical value and is of interest in other points of view. It is quite evident that this company, if the report of the President may be considered as a fair representation of the opinions of the Directors, do not have much faith in new improvements. This view we do not indorse. We hope to live to see the time when ten words shall be transmitted in the time now occupied in sending one. The opinions expressed as to the impracticability of doing telegraphic work faster than it is now done we deem to be without any solid foundation. But so long as telegraphic business is limited by high tariffs, and the capacity of the present system is ample to do the work required, the value of a system of fast telegraphy will not be appreciated by telegraph owners. We advise our readers, therefore, to remember that there is another side to this question, to which we perhaps will at some future time again recur.

Mr. Orton in his report says: For many years past, efforts have been made to perfect a system of rapid telegraphing, which should be able to transmit several times as many dispatches per hour over a telegraph wire as can be done by the Morse instrument. The theory upon which all the experimenters in this direction have proceeded is that electricity has a definite velocity like light, and that all that is necessary to produce the most rapid writing at any distance is an instrument to record the signals produced by an automatic process, similar in principle to Professor Morse's original type and port rule transmitter.

In 1844 Mr. Bain, of Edinburgh, devised a plan of perforating the dispatches for transmission through a strip of paper, in the characters of the Morse alphabet. The prepared paper was then passed between a metallic comb and roller, which were in connection with the line wire, the circuit being completed when the teeth of the comb passed through the holes in the paper. At the receiving station he used chemically prepared paper, upon which the messages were recorded in colored dots and lines. The apparatus, although very attractive in theory, has never been of any practical value, as the time occupied in preparing the messages for transmission is many times greater than that required for sending by the Morse system, and an equal, if not greater length of time is consumed in copying them, while the Morse operator, who reads by sound, copies his messages as fast as they are sent. Subsequently, Mr. Humaston and others invented instruments for more rapidly perforating the paper, which it was thought by some would bring the "fast system" into general use, but these anticipations have never been realized. Mr. Humaston's apparatus, although very ingenious in design, is of so complicated a character as easily to get out of order, while its capacity for producing the Morse characters, when worked by an expert operator, is only about one third as great as that of the ordinary hand key. Added to these difficulties are the still more serious ones that messages cannot be sent by this system at a faster rate of speed than by the ordinary Morse apparatus, except over comparatively short distances; that it cannot be used upon a wire strung upon poles with other wires; nor will it work during a magnetic storm, except by the employment of a double line. Taking all of its merits and demerits into account, it is so greatly inferior to the Morse, and other systems in use, that it cannot be profitably employed either in connection or in competition with them. When the fast method was invented the relative proportion of telegraphic facilities to the requirements of the public was very small; but during the score of years which have intervened the rate of increase of the lines has exceeded that of the business, so that at the present time there are not only enough wires to transmit all that is offered, but they are equal to the performance of a much larger service, provided the messages could submit to a delay as great as that required to prepare them for transmission by the punching process. Therefore, the introduction of the complicated automatic system, even if it were practicable, is unnecessary.

The bulk of the business is received at our offices for transmission between the hours of eleven A. M. and two P. M., and all must receive immediate dispatch—both law and custom requiring that every message shall be forwarded in the order of its receipt. This peculiarity of the service necessitates the erection of many more wires than would be necessary if the work could be spread over the whole day. In Belgium speed rates are established to compensate for the loss by the reduced tariff, and a telegram requiring immediate transit is charged three times the ordinary rate. This innovation is embodied in the so-called postal telegraph system sought to be introduced in this country. Were this plan inaugurated here, business men, to whom time is money, would be obliged to pay an extra price to secure that promptness and certainty of transmission without which the telegraph is of little value for all important transactions.

The value of the telegraph does not consist in the amount of time which can be saved by it over the mail or other means of communication, but in its practical annihilation of time. A telegraphic dispatch, for example, might occupy two days in going from New York to London, and yet reach there eight days in advance of the mail, but this would not be a proper performance of the functions of the telegraph. Instant and constant communication is what is required, and hence the introduction of any apparatus which interposes an unnecessary delay in the preparation of dispatches, either for transmission or delivery, is a change for the worse This is a disadvantage which the so-called "fast systems" labor under, and which will forever preclude their use.

The automatic system, however, is especially unfitted for the transmission of press reports, as this process enables but one station to receive at the same time, while the Morse wires can be connected throughout the country, and the news sent to every office with a single manipulation. The preparation for transmission of so great an amount of matter by the punching process as we daily transmit for the press, would entail an expense for labor and machinery far greater than the entire receipts of this company for regular press reports.

The double transmitter—an apparatus for working both ways over one wire at the same time—has also long occupied a prominent place among speculative telegraphers, and has recently been extensively advertised by the promoters of various competing lines. During the past twenty years there have been several inventions for accomplishing this result, the first being that of Dr. Gintl, of Germany; but while it is possible, under certain exceptional circumstances, to transmit messages both ways at the same time, over one wire, the conditions under which this result is obtained are such as to render the general use of the system impossible. If there were, however, any practical value in this apparatus, its use—like that of the Morse telegraph—is freely open to all.

The following is given as the composition of a good bath for electro-plating metals with platinum: In a solution of chloride of platinum sprinkle finely powdered carbonate of soda until bubbles of carbonic acid gas cease to appear, add to this solution equal quantities of glucose and sea salt, until the coating of platinum loses all blackness and becomes of the natural color of the metal. The advantage of this bath is that it may be concentrated to any degree, and thus maintained for a long time. The articles to be plated are placed in a pierced zinc receptacle, and the bath heated to about 140°; after a few moments the articles are withdrawn, washed, and dried in sawdust.

A copy of the Declaration of Independence in Chinese and on silk is on exhibition in California. The silk on which it is written, measures about five feet in length and twenty inches in width.

Improved Knife Guard.

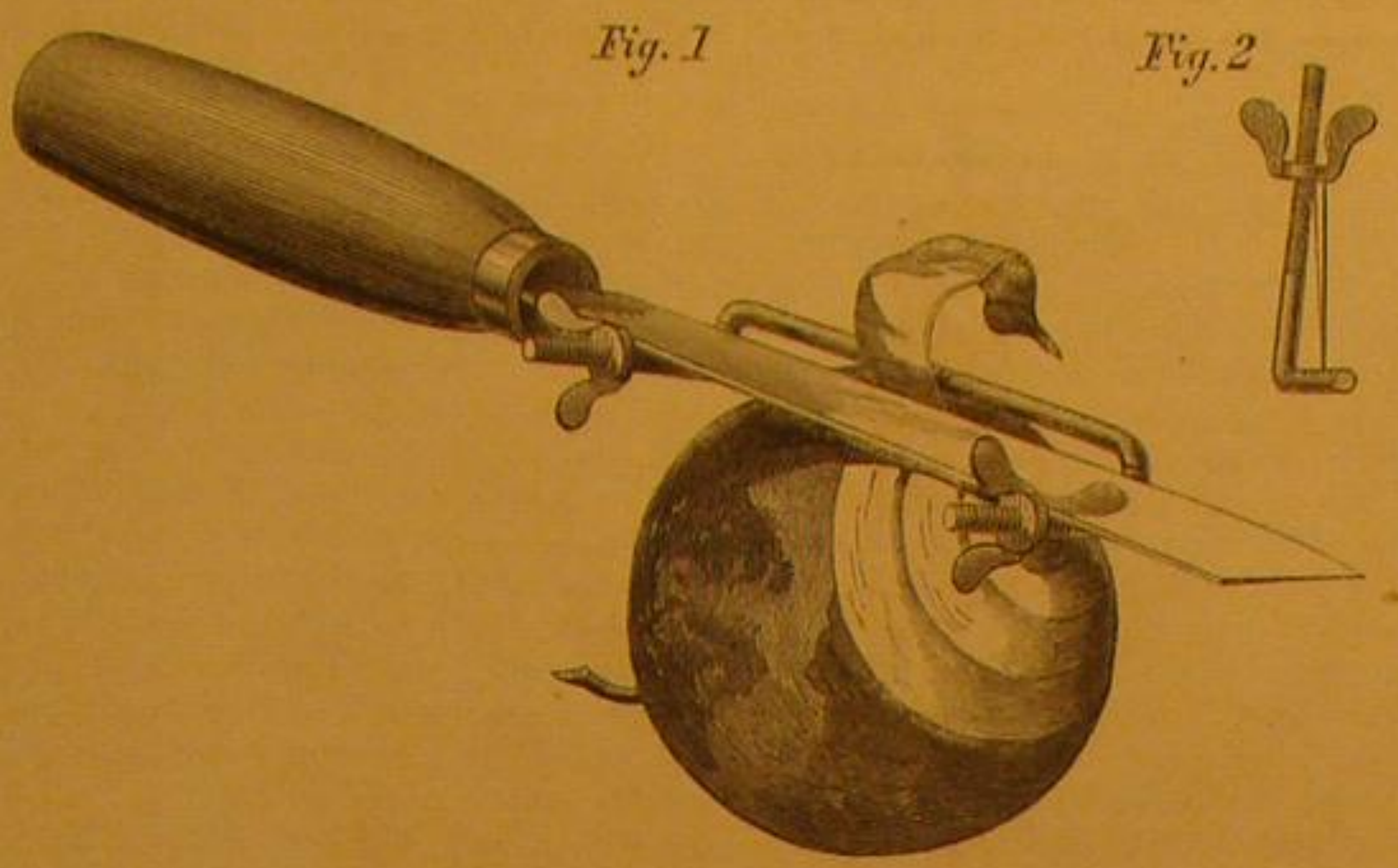
This neat little device has for its object the provision of a simple attachment to knives used for peeling fruits and vegetables, so as to gage the thickness of the paring; and it may also be advantageously used in slicing, perfect uniformity of thickness in the slicing being very desirable in properly drying apples and other fruits.

Fig. 1 shows a knife, with the guard attached; and the detail section in Fig. 2 shows the simple method of attaching it to the knife blade.

The guard consists of a wire, bent twice, at right angles, so as to leave a portion lying parallel to the edge of the blade The edge of the blade engages in nicks on the elbows thus formed, these nicks being cut at uniform intervals at both ends of the guard, so that the latter may be adjusted to any required thickness.

After these bent portions of the wire pass across the edge of the blade, they are turned up again at right angles, and a thread is cut upon the extremities, upon which small thumb nuts are placed. The edge of the knife blade being placed in the desired nicks, above described, the thumb nuts are turned down to engage with the back of the blade, thus firmly fastening the guard.

Fig. 1 *Fig. 2*



GOODES' KNIFE GUARD.

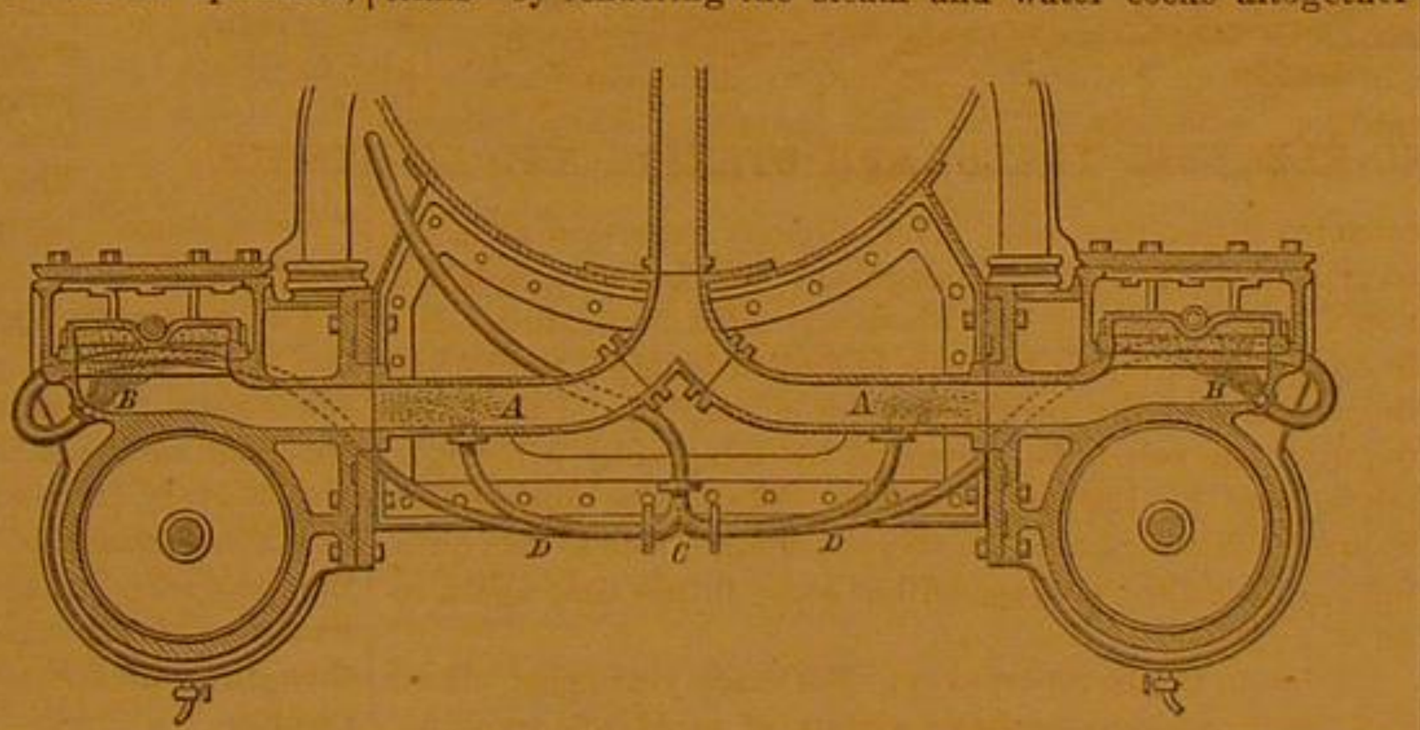
Simple as this invention is, it is one of that character which is, on the whole, most remunerative. Its advantages are obvious to the merest tyro in invention, and its expense must be a mere trifle.

Patented, through the Scientific American Patent Agency, Oct. 5, 1869, by E. A. Goodes. For further information address the Philadelphia Patent and Novelty Co., 717 Spring Garden st., Philadelphia, Pa.

THE USE OF COUNTER-PRESSURE STEAM IN THE LOCOMOTIVE ENGINE AS A BRAKE.

The work of M. L. Le Chatelier, noticed in our last, entitled "Railway Economy," and in which the above subject is discussed, is probably the most important work on railway engineering recently published. The improvement in the application of counter-pressure steam which gave rise to the work, we consider the greatest advance made in railway engineering since Stephenson demonstrated that a train could be drawn on smooth rails by smooth surfaced wheels.

We shall give an illustration and an account of this improvement, extracted from the treatise above alluded to, which will serve to impart a general idea of its nature; but there are many nice scientific points connected with its operation, which the reader will seek from the work itself, and which will amply repay the research.



The author gives the history of the improvement as follows:

About the middle of 1865, when I first thought of organizing a system of experiments for removing the difficulties of reversing the steam, I began by trying whether it would be possible to work the engine for any considerable time by means of the compressed-air apparatus of M. de Bergue. I soon convinced myself that the heating of the cylinders went on so rapidly that this system was inapplicable for any length of run. It was then that I drew up a complete programme of experiments, the sum and substance of which was to establish a communication between the boiler and the lower end of the exhaust pipe, in order to supply there a jet of steam or of water, and to force into the boiler the elastic fluids—steam or gases discharged from the cylinders by the return stroke of the piston. I pointed out three combinations to be experimented on in succession, according to the greater or less difficulty found in completly cooling the cylinders.

1st. Injection of steam mixed with air.

2d. Injection of steam in sufficient excess to prevent the entrance of air.

3d. Injection of water, instead of steam.

At first I supposed that the steam would carry along with it a sufficient quantity of water to absorb the heat produced, and that it would be condensed before reaching the cylinders. This idea was incorrect. During the working with steam reversed, the water ceases to be in a state of violent ebullition, and is only carried over in small quantities; and, besides, when the steam expands in issuing from the boiler, it dries, and the small quantity of water brought with it is almost entirely converted into steam.

The first experiment with a mixture of steam and gases drawn into the cylinders did not give favorable results. With the injection of an excess of steam—a system which I characterized as an *inverted steam engine*—more satisfactory results were obtained, and it was found possible to work with a moderate admission of steam with light loads on moderate gradients, without burning the packings, and without injuring the rubbing surfaces. We have in France the example of a railway on which 200 engines have only a cock for the injection of steam, and the substitution of this for the gases drawn from the smoke-box has proved sufficient to render the counter-pressure steam applicable for stopping and shunting in stations, and for moderating the speed in the descent of goods trains on gradients of 1 in 260. Indeed, the injection of steam alone has been effectually applied to light trains on a short incline of 1 in 22.

But experience soon showed that the only general and complete solution of the question is found in the injection of water. To complete the absorption of the heat produced by the compression in the cylinders, to force back the steam into the boiler, and to render the reversal of the steam an absolutely innocuous operation, water is the only appliance.

The engineers in Spain, to whom I intrusted the experiments, never quite understood the effects which the injection of water should produce. The application of it was therefore made with timidity and with doubt.

They imagined that it must be reduced to the minimum quantity. As a consequence, the results obtained in this, the first application, were never complete, despite successive increments of the quantity of water added to the steam. It was in France that engineers first recognized the necessity of giving a great preponderance to water over steam, and thus succeeded in rendering the new system applicable under every circumstance of the locomotive service.

For many months the official reports sent from Spain announced that the results obtained, from a mixture of steam and water, were quite satisfactory, but this was afterwards proved not to be the case. For two years and a half after my first programme was drawn up, this idea, that the solution of the problem consisted in injecting a mixture of steam and water in the exhaust pipe, prevailed. By successive trials—by rendering the steam and water cocks altogether independent of each other under the hand of the driver, the suitable proportion of water to steam in the various circumstances of admissson, speed, distribution, and dimensions of cylinders, was arrived at. It is by correcting this erroneous notion, which attributes to steam a necessary part in the action, that in France alone the system has been applied to 1,800 engines in work, or being fitted with the necessary apparatus. The practical result has been complete, because of the independence of the injecting cocks, which has allowed of the proportion of water being carried to the necessary limit in each case.

At the end of the year 1868, being free from my usual ocupations, I determined on a consecutive study of the question, and on the verification of the results which had been obtained independently of my control. I soon perceived that my original notion—on which I had often by correspondence insisted—was correct in every respect; that the true solution consisted absolutely in the injection of water—that this solution satisfied every condition of the problem, and is probably the only one entirely applicable in cases of full admission and great speed. Steam, in fact, plays only a secondary part, prejudicial when above certain proportions, and, when used, to be applied with great caution, and only within certain limits.

When we speak of injecting water issuing from the boiler into the cylinders of a locomotive engine, it must be borne in mind that it is not water in the state in which it would flow from a fountain; it is at a high temperature when it issues from the boiler, and rushes into space at atmospheric pressure. It enters at once into ebullition, and becomes steam at 100° C., in quantity corresponding to the heat employed.

The new system of reversing steam has been, until recently, limited to the use of a mixture of steam and water. The engineers to whom I had intrusted the task of making the first trials, followed my instructions with some apprehension, endeavoring as much as possible to avoid the injection of water into the cylinders. The result has been that, even now, in Spain, where these first trials were made, the use of counter-pressure steam has not had the success which it has had elsewhere. In France, the part played by the water was better understood; it has been abundantly injected and the results have been most satisfactory; but up to the moment when I had an opportunity of personally experimenting, in order to verify the correctness of my first conceptions, steam was universally considered as a necessary agent, and was used in a greater or less proportion. It was supposed that its function was to fill the cylinders during the period of aspiration, and that it served as the vehicle for the water which was shut in with it, behind the piston, at the moment the period of cushioning and forcing back commenced. It was supposed that the water led from the boiler was applied directly to the absorption of heat.

I have shown that the water is converted into steam from the moment that it enters the cylinder, even during the period of aspiration, and the conclusion is that not only is it not required to take steam directly from the boiler, but that the addition of steam to the water, beyond a certain limit, might become prejudicial.

In every case the substitution of steam for, or the addition of steam to water, results in a discharge of a less moist steam from the cylinders into the boiler, and it is the same with the steam in the exhaust-pipe used for aspiration. The rubbing surfaces are therefore drier, and the friction greater. The more the proportion of steam is increased, the more these effects become sensible. At last the steam actually diverts the water indispensable for the absorption of the heat although large quantities of steam escape by the funnel, and, although no gases from the smoke-box get into the cylinders.

The intervention of steam during the working with inverse admission, unless required for some particular purpose, which I shall point out presently, is always more or less prejudicial. The rule, in fact, should be, to add the least possible quantity of steam to the water. The wet steam, on the water issuing from the boiler, gives this minimum proportion.

The apparatus to be fitted to the locomotive to admit of working counter-pressure steam as a brake, is as simple as the principle itself. It consists of a tube of an inch to an inch and a quarter in diameter—one inch diameter is very convenient—which communicates between the boiler and the exhaust pipe, and a distributing cock by which the driver regulates the supply. If, as I advise, although it is not indispensable, it is desired to have the power of injecting water and steam alternately or simultaneously, a second cock is placed, with a short tube as a branch from the first, at a short distance from its origin. The one tube enters the boiler below the lowest level of the water, the other above the highest, so that steam only shall pass through the latter.

When the engines have external cylinders, the exhaust-pipe divides into two branches. The injection tube must therefore have also two branches; one going to the under side of each branch of the exhaust pipe. The bifurcation should be perfectly symmetrical, so that the water held in suspension in the steam may not take the line of steepest descent, and that the distribution to each cylinder may be equal.

The engraving shows how the injection tube is joined to the exhaust pipes at two distinct places; but various other arrangements may be adopted.

The pipes, D, leading from the boiler to the exhaust. discharge into the exhaust at the point A, or B, the engraving representing at one view two different arrangements in this respect, showing two distinct ways in which the wet vapor may reach the cylinders. The branch piece C, should be of brass, and should be joined on to a *straight* length as long as possible. The drops of water in suspension in the steam tend to continue to move in a straight line, by virtue of their inertia and of their quantity of motion. If the bifurcation be not symmetrical, the distribution is unequal. Again, it is essential that beyond the point of bifurcation the two branches of the tube should have the same length, the same form, and the same section. Thus it will be found convenient to carry the tube under the center of the boiler; or, if room can be found for it, along the back of the boiler, in order to place the bifurcation at equal distances from the two cylinders. Want of symmetry might, of course, be compensated by difference of section in the tubes; but it is better to use a greater length of main tube in order to reach a point which allows of a perfectly symmetrical arrangement.

The injection of water might be used with the ordinary lever arrangement of reversing gear, where the consequences of a sudden spontaneous return of the handle would be unimportant. But the application is only quite satisfactory when the screw motion is used, as adopted by M. Marié, after Mr. Kitson's model. This apparatus, as a complement to the counter-pressure steam, has rendered most important service. Without it there must have been a long struggle against the natural repugnance of the engineers to reversing the steam. With it, the continual changes of the degree of admission, in order to maintain a uniform speed on lines with many changes of gradient, or for stopping trains at the right point in stations are made without fatigue or anxiety to the engineer. There are no longer sudden jumps from one notch to another; the regulator remains open, and consequently all the manipulations are more quickly effected, even when the steam has to be rapidly reversed. It is to this happy combination that the rapidity is to be ascribed with which the Paris, Lyons, and Mediterranean Company have already adopted (May 1869) the counter-pressure-steam apparatus for not less than 1,400 engines.

Correspondence.

The Editors are not responsible for the Opinions expressed by their Correspondents.

The California Fairs---How San Francisco Looks to a New Yorker.

MESSRS. EDITORS:—Referring again to the Mechanic's Institute Fair, I would remark that although it is almost wholly an exhibition of the productions of this side of the Rocky Mountains, there are not a few articles, mechanical as well as merchantable, brought hither from the busy towns of the most eastern easterly States. So large an assortment of washing machines, for instance, could never be gathered in any part of the world without the help of New England. And so of brick machines, though prominent among these for apparent efficiency, is the "Climax," born, I think, of these west-coast minds.

Two articles there are which pre-eminently represent California as we have known and read of it any time these twenty years past—one an ore crusher, with its half dozen heavy pounders almost constantly busy in reducing golden stones to powder; and the other an immense wine cask, capable of containing something more than four thousand gallons of California's choicest juices. If one of those crusher-pounders were but playing its ponderous tune in that big barrel, I should be obliged to recall scenes of early youth when the family linen was duly pounded into cleanliness.

A very ingenious contrivance in the application of steam to pumping—so much of which is required west of the mountains—is Martin's oscillating engine and pump. Both consist of two cylinders cast in one piece, the two piston heads connected by rods on the outside, the steam and water being admitted and discharged through the oscillating shaft at the center of the casting.

In the same line of improvement, but not like the first, adapted to use for power purposes, is the Wilcox Steam Water Lifter. In this the steam itself acts directly on the water by means only of an intervening plunger, the steam being admitted at one end and the water at the other end of the same cylinder.

One of the peculiarities of Californian life, or rather one of the evidences that Californians are fully "posted up" in the movements of the day, may be seen in the stands set apart for institutions connected with what are popularly called "Women's Rights." Among these is a Women's Printing Establishment, where orders are taken, and the work executed and delivered without aid or intervention by the lords of creation. Connected with this are women artists and women engravers, and the establishment really covers all the demands made upon it, by the labor of the fairer sex. Indeed the artist and wood-engraving department is, as I know, carried into some fine mansions here, and supersedes the useless fancy stitching and embroidery once the only way of killing time among their inmates.

But it is full time that I left the Fair building and remarked upon the appearance and construction of the city. To how great an extent San Francisco depends upon the neighboring forests can scarcely be realized save by ocular demonstration. Suppose, if you can, that every brick and stone of whatever variety were removed from the great city of New York! What would remain? Possibly a few buildings of iron and wood; but would not the city be gone, and its very site an unmarked wilderness?

And just so much, and nothing more, would remain of the city of San Francisco if once the wood were removed. Beginning on the ground the street pavements would disappear—not principally Nicolson either, but plain common planks two or three inches thick. After them would go the sidewalks and curbing—then the fancy fencing to door yards, some of which vies with our best iron railings in beauty of design and finish—then the porches, and steps which appear to the passer by as the equal in solidity, as in ornament, of those grand entrance ways on Fifth avenue. And, lastly, the apparently solid blocks of sandstone and granite so deftly wrought, imposing in more senses than one—the very body and walls of the house—would melt to nothingness. A few slender brick chimneys and a few heaps of crumbled plaster might be said to remain sole evidences that a great city once existed.

Next to the construction of the houses the manner of improving the ground is worthy of remark. "'Frisco," as Californians love to call it, is located on the sides and at the foot of sand hills. Below, the streets are level and regular, but on the side hill, necessity rules, and the front door of the house is often thirty, if not forty feet above the street. On the street line appears a common stone wall ten to twenty feet high. The wall is rough and ungainly—unpromising to the last degree—and the rude doorway pierced through it, has all the appearance of leading to the kitchen. Entering, we rise by successive flights of stairs, and emerge upon a delightful parterre of flowers and shrubs. The house stands sufficiently back, and so entirely by itself as to possess nearly all the attractions of a villa in the country, while its windows command the whole city on the plain below, with the blue waters of the bay beyond and the distant mountains. B.

San Francisco, Sept 30, 1869.

Machine for Picking Cotton.

MESSRS. EDITORS:—In your number of July 24th, B. W. Woodward asks for a cotton picker, but repudiates the tin tube and chain picker style. I would like with your permission, to offer a few suggestions as to what is necessary in order that mechanical appliances may be made to do the work of cotton picking.

In the present condition of cotton culture it is necessary that anything that does the gathering shall have an intelligent controlling power to direct, in order to reach the individual bolls without damaging the plant; this cannot be imparted to machinery; therefore it becomes necessary that the cotton plant itself shall be so improved or modified that the whole of its produce shall be ripened at one time (much more difficult problems have already been solved by horticulturists) and if but one plant out of the many cultivated can be found answering to this requirement it will take but few years to seed this whole continent, then, and not till then, can we expect mechanical ingenuity to assist in the gathering of the crop. A. D. C.

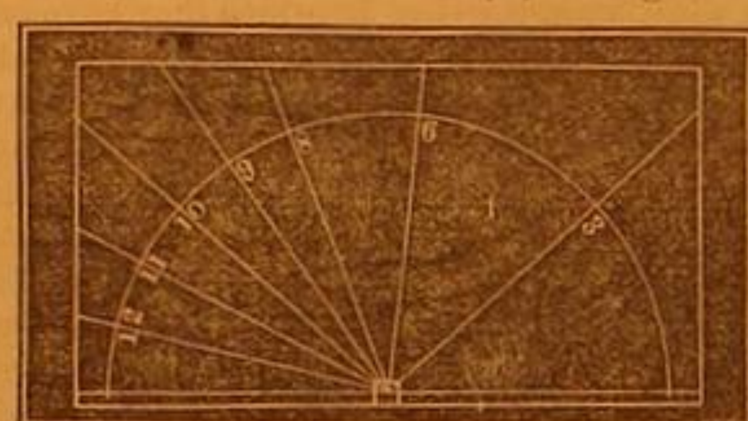
New Madrid, Mo.

Setting Work on the Face-Plate of a Lathe and Spacing Circles.

MESSRS. EDITORS:—I beg to offer some practical suggestions on the above subject, where great accuracy is required, which may prove of service to some of your readers.

Let the work be set out, and first lightly prick-punched; then clamp to place lightly as near as possible, but never set the "dead center" against the work, for that will not bring it true—now with a "scratch-awl" or a sharp-pointed center, with the point resting in the prick mark, and the other end held against or on the "dead center," revolve the work. If the point marked for the center of the hole is out of truth, the "scratch-awl," or whatever rests in the point, will vibrate. Put into the lathe rest a tool, without fastening it, and push it up to the scratch as the work is revolved, and the extent of the vibration can be seen. The work can be driven as thus indicated. When there is no vibration of the scratch or center, the work is perfectly set, and may be securely fastened. I regard this as the only perfect way to set work, and yet good workmen (?) take some other way.

In your reply to a correspondent who seemed to have something for readily spacing a circle, a few weeks ago, I was reminded of a plan I used successfully years ago.



I took a well-seasoned board something wider than the half of any circle I expected to space, and more than twice as long, so as to get the half circle upon it, and drove a bit of hardened steel that was pricked for the center into the center of the circle. I then drew with a sharp knife a line through this point the whole length of the board. This was the diameter, or my starting point, line. I then spaced this half circle with dividers into twelve or any other number of spaces, beginning always at the left, so as to have the spaces right for a whole circle, then with the sharp knife I drew lines from the center through the points spaced on the circle, and numbered them with ink from twelve round to three. I then varnished the board. To use it now, take the dividers, open half the diameter of the circle you wish to space, and with one foot on the steel center touch the first line on the board (chalked so as to mark through the chalk and not deface the board) and then the line numbered for the spaces you wish; the distance between the lines thus marked was the right distance for that circle in spacing it. The board was subject to atmospheric changes, of course, and so was not perfectly reliable, but sufficiently accurate for a good deal of work in a machine shop when templets could not well be used. WM. L. BULLOCK.

Fitchburg, Mass.

Correlation of Forces---A Meteorological Fact.

MESSRS. EDITORS:—In connection with the theory of "Correlation of Forces," some curious ideas are presented.

In producing electricity by friction, for instance, it is evident that two surfaces should be rubbed together that will produce the most friction with the least heat. Whether the old amalgam rubber and glass are the best for this purpose is doubtful. I would suggest that the well-known "biting" quality of turpentine or benzole might be used to advantage.

Again: If two polished and plane surfaces of totally inelastic material are placed together, these might be *forced* together with a pressure of any number of thousands of tuns by the bending of a hair, for, as there could be no motion, or heat, or electricity produced, the force applied might theoretically be multiplied or correlated into pressure simply to any extent. Many other curious notions grow out of the application of this beautiful theory, the principles of which ought to be understood by every inventor especially.

But I have a fact to communicate in relation to meteorology.

The early summer here, latitude 42°, was very wet. About the 1st of September commenced dry south winds, which have blown, with occasional intermission, all the month.

The first week I predicted an extraordinary rise in the river, for I reasoned thus, both theory and previous observation being my guide:

These winds take up a vast amount of moisture which must be precipitated on the higher and colder slopes of the Lake Superior dividing ridge, and of course come back to us in the river.

The result has been such a great and persistent rise as was never before known from the same cause. The Mississippi is within a few feet of the highest spring floods, and immense damage has been done in sweeping hay from the bottoms, never before reached at this season. CHAS. BOYNTON.

Lyons, Iowa.

How to Clean Broom Corn Seed.

MESSRS. EDITORS:—In your issue of September 11th, Benjamin Roach, of Natchez, asks for a seed cleaner for broom corn. A very good and simple one can be made by taking an old grain fanning mill, and in place of the arms, substitute a drum, 12 inches in diameter; on the outside of this drum, nail strips all around, first driving through the strips 16 penny nails, after the manner of a thrashing cylinder; take the broom corn by handfuls, and hold it to receive the action of these teeth while revolving; two men can clean while one turns. A. D. C.

New Madrid, Mo.

Fires from Steam Pipes.

MESSRS. EDITORS:—In regard to fires from steam pipes, I would say that I have been engaged in repairing locomotives some years past, and it is well known that the jacketing of the boiler is matched pine with sheet-iron outside; yet I have never seen any that looked burned. I have noticed some that looked like wood affected by dry-rot, and some of these boilers were worked with a head of steam of 110 lbs. I know also of a 24-horse power engine which has been running eighteen years, the cylinder of which is jacketed with pine, veneered with rosewood, the wood of which is all sound. The same engine is run with from sixty to eighty pounds of steam, with only four feet of pipe from the boiler to the cylinder. C. B. HOYT.

Oriskany Falls, N. Y.

To Keep Pure Air in a Sick Room.

MESSRS EDITORS:—The following simple arrangement will remedy the evil of foul gas, generated by burning a kerosene lamp all night in a nursery or sick room.

Take a raisin or any other suitable sized box, that will contain the lamp when set up on end. Place the lamp in the box, outside the window, with the open side facing the room. When there are blinds the box can be attached to each by leaving them a little open and fastening with a cord; or the lamp box can be nailed to the window casing in a permanent manner. The lamp burns quite as well outside, and a decided improvement of the air in the room is experienced. Try it. "CONVALESCENT."

Filing Saws.

MESSRS. EDITORS:—In your article on "How to file and set a saw," page 252, current volume, you say—"the teeth in cross-cut saws ought to cut both ways," so they should; and I think they should cut *much* more in the downward stroke than in the upward, because in the latter we naturally have little more than the weight of the saw to bear on the wood, while in the former we work the saw inward and downward at the same time, with an extra force from the upper arm and shoulder.

In filing, I pitch the teeth front a little, and give the front edge of the tooth a sharper bevel. It makes a great difference. E. R. RICE.

Clinton, Mass.

[For the Scientific American.]

HOW MAHOGANY IS OBTAINED.

Few persons having their dwellings comfortably fitted out with some old, solid, and yet elegant mahogany furniture, have the remotest idea with how much labor and hardship the cutting of the mahogany tree is connected. To prove the correctness of Mr. Squier's remark in his "Travels through Central America," that "of all the out-door works, the cutting of the mahogany is the most laborious and the roughest," we will give a brief sketch of how the work is done, having been associated with that kind of business for several years.

The countries where most of the mahogany trees grow are principally St. Domingo and the Central American States. British Honduras, Guatemala, and Honduras furnish a superior quality, as also the largest logs. The latter are mostly shipped to England, while the smaller logs, say from three to six feet in diameter, are shipped to the United States under the name of "Yankeewood."

The cutting of the mahogany trees is conducted as follows: The tract of land selected for the works must be so situated that it is easily accessible through rivers, creeks, or canals, which run into a sheltering bay or harbor, where the vessels can lie and receive the wood. The lands are leased from the government for a certain number of years for which lease the manager has to pay annually a certain sum of money—some two hundred dollars or more, according to the land he occupies and to the circumstances under which he makes the bargain. For every log which he ships he pays from five to ten dollars—the different States varying in their taxes.

The number of workmen necessary to carry on the business on a large scale is about one hundred, who belong to different nations—Caribs, Sambos, Indians, and Spanish Americans. They are engaged for ten months, as no work is done during December and January, on account of the heavy rains. The men receive from ten to twelve dollars per month, payable half in goods and half in cash, besides their weekly rations, consisting of seven quarts of flour and four pounds of salt pork. Whoever has once witnessed the scene of paying out the rations will never forget it. It is always a scene of tumult and general dissatisfaction which often ends in a revolt. The cause is that the workmen always pretend that the flour was not properly measured or the meat not properly weighed. This giving out of rations is always and everywhere the work of Sunday mornings, and it is therefore so much more painful to a man who remembers the peaceful Sunday mornings of a northern home. Each nation has, of course, a distinct language, and as all speak at once in the most vociferous manner, the scene often resembles a second Babel. The workmen are divided into "gangs," according to their nationalities, and the work which they are required to accomplish. The heaviest work is done by the Caribs and Sambos; the Spaniards have the charge of the cattle, while the Indians are used as carriers, hunters, etc. All the laborers are under the inspection of a captain or overseer, under whose command are two or more foremen or second captains. As soon as the men are thus organized the work begins.

First of all roads have to be made, in all directions, leading towards the water's edge. At four o'clock in the morning a shell is blown by order of the foremen as a signal that it is time to get up. The men then prepare their hasty, frugal breakfast, consisting of a piece of boiled pork and a dumpling made of flour and water and boiled with the meat. At a second signal they have to appear before the captain's hut armed with their hatchets, etc. When the names of those present have been called out, and the missing ones noted down, the captain marches them off, and sets them at work. This is no small job, as the work in these countries is only done by tasks and not by the hour. The captains have, therefore, to measure and mark each separate task, and in the evening it is their business to see if the tasks are all properly finished. In making truck paths and other roads, twenty-five to thirty feet are called a task. The work consists of clearing away trees and bushes. As it often happens that one has, in his distance, many large trees to cut down, while the next one has nothing more than bushes, of course a great deal of grumbling and dissatisfaction is manifested, but they have to manage that between themselves and help each other. Very often they finish their task by ten o'clock, and they have thus the rest of the day for themselves to cultivate their gardens or corn patches around their huts, or to go hunting, as many of the laborers have wives and children with them, and the usual rations would not be sufficient for the wants of a family. The different nationalities keep apart from each other, and the little colony is divided into settlements. The animosities existing between the different inhabitants greatly augment the trials of the manager.

While some of the workmen are thus preparing the roads several explorers are sent out in different directions through the almost impenetrable wilderness, to hunt up and mark such mahogany trees as they think are good and sound. Many of the larger ones prove to be hollow, which, of course, is loss to the owner if time is expended in cutting them. The hunter is paid from twenty-five to fifty cents for each tree which he marks. He has no compass or means to show him his position in this vast forest, his only guide is the sun, and often he is obliged to climb on a tree in order to see it.

The cutting of the trees is an interesting and almost a dangerous process. As the roots of the mahogany tree project sometimes more than ten feet above the ground, a sort of scaffold has to be erected at the hight where the trunk of the tree commences. This scaffold is simply made of creepers, about half an inch in thickness, fastened around the nearest trees. The cutting is done with the ax in the hands of the Caribs, and it is a most exciting sight to look upon these men as they stand barefooted on a single limb and swing their axes with all possible ease. If one of them loses his equilibrium, which seldom happens as they consider it a dishonor, it always causes a great deal of merriment among his fellow workmen. The actual felling of the trees depends very much on the wind and weather. If the wind is contrary to where the trees are intended to fall, they have to wait for another chance; neither ought the trees to be cut while the moon is increasing, as the wood would not be so valuable for future use. There are not more than four months in the year when the actual cutting can be carried on, and it is therefore necessary that everything should be prepared and in good working order when the right time arrives.

The trucking and sleighing of the trees down to the river or creek forms another important operation. Every tree is rolled into the water amid the loud cheering of the laborers. Fourteen cattle are usually yoked to a truck, but if the tree is one of the largest, twenty-eight cattle are used. Generally three, but sometimes only two trips are made in a day, each trip with a different set of cattle. It is almost impossible to give the reader an idea of the difficulties and tediousness of the trucking; it can only be partly imagined what an immense trouble it is to make fourteen or twenty-eight half-wild oxen work together or to guide them. As soon as the rains have set in, the sleighing commences; mud here taking the place of the snow of northern climates. The loss of cattle is always very great, caused by the carelessness of those who have the charge of them, or by many other unavoidable circumstances. Many straggle off into the woods, where they are often attacked and killed by tigers, always to be found hovering around the cattle-yards; while others get into the swamps, in search of water, from whence they are unable to extricate themselves, and as there is no possibility of helping them out they are left to die. Half of the oxen are always on the sick list, disabled by over-work, or some other casualty. In this condition they are driven to a place where they find their own food, while those that are in working order are kept in a yard and fed with the leaves of the bread-nut tree, which the Indians have to cut down for them. As soon as the rivers and creeks are swollen by the heavy rains, the rafting begins. If the owner loses the opportunity of floating down his wood during the high water, he will have to wait till the next year for another chance. This work requires a great deal of attention and calculation; if the rafts are not properly "boomed," it often happens that the wood is floated off and washed into the sea, where it rarely can be fished up again.

As soon as the rafts approach the bay or harbor they are moored, and the trees are drawn out of the water on some level piece of land, where they are squared, measured, and cut in logs of suitable length for shipment.

We have only given the roughest outlines of how the work is carried on; but we have said but little of the many trials which the manager, who is in most cases a foreigner, has to undergo. If he is a man of education and cultivation, his sufferings are endless, and yet it is absolutely necessary that he should be on the spot, to keep order and superintend the business himself. Though his hut may be somewhat better than those of his men, yet he can have but little comfort; he is, like all the rest, whether indoors or outdoors, besieged by hosts of scorpions, tarantulas, frogs, snakes, rats, and numberless other animals which make his hut their habitation. The climate, the surrounding swamps, and the rank vegetation, are the causes of fevers which attack him. These are, however, only bodily sufferings, to which human nature can get more or less accustomed, but the mental trials are still greater. Every extra stroke of work must be paid by a drink; and should the owner neglect to have a supply of rum on hand, the most serious consequences might follow. If he is not fortunate enough to secure a reliable captain he is constantly cheated, but is powerless to prevent it, as he can only be at one place at a time. The owners and the captains are always prepared for an attack from the workmen, and never go out without guns or pistols. We have seen mahogany captains covered with as many wounds and scars as a veteran soldier. Another great trouble to the manager are the "runaways." He is more or less in subordination to his men. The laws of the mahogany works are such that he is obliged to pay his men two or three months in advance. With this advance money they go off to some neighboring works and engage again under some other name. This changing of names is quite a peculiarity among the cutters; with every new master they adopt a new name. If the former master is lucky enough to find out where the runaways have gone he can only claim them when the time for which they have engaged with their second master has expired. Then he can only force them to work out their advance pay, but this does not indemnify him for his loss, for often the few working months are passed and his allotment of trees have not been brought out.

These troubles are almost daily occurrences in all the mahogany works, and are considered a necessary evil. The government is obliged, by the annual tax paid by the owner, to afford him all possible protection and aid in the recapture of the runaways, or to punish any disobedience, etc.; but it is always much better for the superintendent to avoid, if possible, recourse to the public authorities, as it causes him extra expense and loss of time, losses nowhere so much felt as in this business.

We have thus far only described the dark side of the life in the mahogany works, let us look, therefore, upon a more agreeable picture. Passing through the different settlements during an evening, we shall find, in spite of the warmth of the clime, large fires blazing everywhere, to keep away all animals that usually sneak around at night, and drive off the swarms of insects that fill the air. Men, women, and children are grouped around these fires, giving the scene a gipsy-like appearance.

Let us pass through the Carib settlement; it is particularly lively here. They always have some kind of a genius among them, who takes charge of the evening's entertainments. We see him balancing himself on the trunk of a fallen tree or on an empty flour barrel, and he is delivering a speech amid many gesticulations. We understand little of their jabber; the words "father" and "mother" are often repeated, and are ever received with loud acclamations from the attentive and appreciative audience.

Parental love is a marked feature in the character of this people, and the most of the haranguing which they greatly affect is based on this subject. Upon the whole they are exceedingly boisterous in speech and action. The stranger is often induced to believe that they are quarreling or ready for a fight, when a sudden outburst of laughter will convince him of his mistake.

As we proceed a little further in our evening ramble, we meet an entirely different scene. We are among the Spanish speaking people; they are much more quiet. We stop to listen to the monotonous melody of some Spanish ditty, sung in a falsetto voice by a native, and accompanied by the guitar. There is not much music in their songs, but they are melancholy, and therefore touch the heart.

As we turn again towards our own gloomy hut, the desire and hope of a prosperous season in our mahogany business is greater than ever, as it will afford us the happiness of returning to our former home and associations.

GREAT FIRE AMONG THE SHIPPING AT BORDEAUX.—The particulars of the great fire in the shipping at Bordeaux, in France, on the 28th of September, have reached us, and show the very great danger of permitting petroleum vessels to moor alongside or even in proximity to other vessels. This fire originated in the sudden explosion of a lighter laden with petroleum. The lighter was lying at anchor in the harbor, near Lormont. The petroleum casks, wafted by the tide, communicated the fire with frightful rapidity to the vessels moored to the quay. The conflagration lasted the whole night, and between twenty and thirty large vessels were destroyed. The amount of the loss is as yet impossible to estimate with anything like certainty, but seventeen vessels were totally destroyed, and many others injured.

How to Build a Corduroy Road.

The border settlements of our country have frequently to resort to the construction of corduroy roads, these roads remaining for years in some cases before a better road can be constructed. The proper construction of such a road is therefore a matter of no small importance to these settlements. Properly laid down, a corduroy road is not so bad a thing as the improperly constructed ones, which have, at some period in the experience of most Americans, tried their patience to the utmost, would lead them to believe.

On the contrary, we have ridden over a road of this kind which was a very comfortable road, and in nowise destructive to team, vehicle, or temper.

Mr. T. F. Nicholl, a civil engineer and contributor to a spirited paper published in Chicago, called *The Land Owner*, gives the following rules for laying such a road, which, if followed, we know from experience, will make a very good road, until the surface becomes uneven through decay of the timber.

"In marsh, or bog lands," says Mr. Nicholl, "where the bog is not deep, and where timber can be obtained, the road-bed may be formed at the least expense by what is known as corduroy, which should be constructed as follows: first lay all small poles or brush transversely and across the road; next take long trees—the smallest ends being at least of 10 inches diameter—and lay them longitudinally along on these poles and brush, in two rows, 8 feet apart from center to center, making the ends at the junction of each piece lap each other, at least 3 feet, breaking joint on either side, and placing under these ends large logs, of sufficient length to extend across the road, and 2 feet on each side of these stringers. Cover these stringers with transverse logs, 12 feet long from scarf to scarf, and at least 10 inches in diameter at the smallest end, fitted close together, on the straight portions; the logs alternated with a large and small end; and on the outer side of curves all the large ends, which will assist in the curvature of the road, and the gravity of the vehicles. Next adze off the center ridges of these logs to a face of about 5 inches for a width of 9 feet in the center of the roadway, and cover this 9 feet with gravel to fill in between the logs and give a smooth surface. The best timber for this purpose is cedar, tamarack, etc., usually found in these localities. Two stringers are preferable to three, as in case of sinkage of either of the outside stringers, the cross-pieces would ride and rock on the center stringer, and, consequently, the whole road-bed become displaced.

"A very desirable plan is to lay on the top of the road thus formed, poles of 5 or 6 inches diameter, spiked down on each side of the track, every 10 feet, with oak pins, to prevent, in frosty weather, the lateral sliding of wagons."

Purifying and Bleaching Oils.

An invention has been patented in England, which consists in the purification, bleaching, and saturation of animal and vegetable oils, also of gums and resins, as well as of such liquids as oil of turpentine, spirits of turpentine, and methylated spirits, by means of ozone, whereby much time is saved and greater purity obtained than by the methods at present in use. The substance to be acted upon, if liquid, as in the case of oils and spirits in their usual state, as well as the gums and resins in the melted state, is placed in a suitable vessel, and streams of ozonized atmospheric air or ozonized oxygen are forced through the substance. It is advisable to keep the liquid in motion, so as to bring its particles in contact with the ozonized air or ozonized oxygen, and thus expedite the process of ozonization, or the liquid substance may flow through a vessel possessing a large superficial area, and into which ozonized air or ozonized oxygen is passed. The great extent of surface permits the ozonized air to act readily upon the liquid and ozonize it. Or animal or vegetable charcoal in fine powder is saturated with ozonized air or ozonized oxygen, and the oils are exposed to the action of the ozonized charcoal. In the case of the gums or resins in their usual solid or unmelted state, the inventor exposes them in fine powder to the action of ozonized air or ozonized oxygen. By the continued action of ozonized air upon oil or spirits of turpentine, the latter becomes so saturated with ozone as to become a vehicle for the conveyance of ozone to other substances. By ozonized air or ozonized oxygen is meant atmospheric air or oxygen ozonized by any artificial means.

The Albertype.

A recent number of the London *Photographic News* contains a fine example of this new style of photographic pictures. The process is as follows: A plate of glass is covered with a solution of albumen, gelatine, and bichromate of potash, dried and exposed to light until hardened. It is then again covered with a solution of gelatine and bichromate of potash, and when dry exposed under the negative, and the film is then found to possess qualities analogous to a drawing made with fatty ink upon lithograph stone. All those portions of the film that were acted upon by the light will refuse water and take printing ink, while those portions which were protected from light by the negative will take water and refuse ink. The ink and water will be absorbed by the film just in accordance with the gradations of light and shade in the negative. To produce a picture, wet the surface of the film, then apply ink, lay on paper and pass through a press; the operation being substantially the same as lithography. The process is said to be rapid, and excellent pictures of all sizes may be printed in admirable style.

To think properly, one must think independently, candidly, and consecutively; only in this way can a train of reasoning be conducted successfully.

Improvement in Turbine Water Wheels.

The class of water wheels known as turbines has been steadily growing in favor ever since the true principles of their operation have been thoroughly understood. Their general adaptation to all heads, their power of running under as well as above water, their compactness, and their power of utilizing the mechanical power of falling water, have given them the first rank among water wheels. There have been, however, some drawbacks which it is the object of the improvement under consideration to remove, as well as, at the same time, to increase the utilization of power in such wheels.

The nature of the improvement will appear from the following explanation referring to the accompanying engravings; Fig. 1 being a top view, and Fig. 2 a vertical section of a turbine wheel, thus improved. In both figures, A represents portions of the wood-work surrounding and supporting the working parts of the wheel. B is the shaft supported by a step, C, as shown in Fig. 2.

The internal or chute-chamber, D, Figs. 1 and 2, is supported from the top by an outward flange or rim, E, which rests upon the top of a cast-iron breast, F, but is not bolted to it. The breast, F, is supported by the wooden framework, A.

The chute-chamber, D, not being bolted or otherwise attached to the breast, F, may revolve, should a stone or other obstruction engage between the outer lip of any of the chutes, G, and the inner lip of a bucket of the wheel, whereupon the wheel speedily comes to a stand-still, and the obstacle which might, on many forms of turbines, have caused serious breakage, only causes, with this wheel, a temporary stoppage. This vertical rotation of the chute-chamber also allows the chutes to be so placed in relation to the buckets of the wheel proper as to secure the maximum effect of the water.

Fig. 1

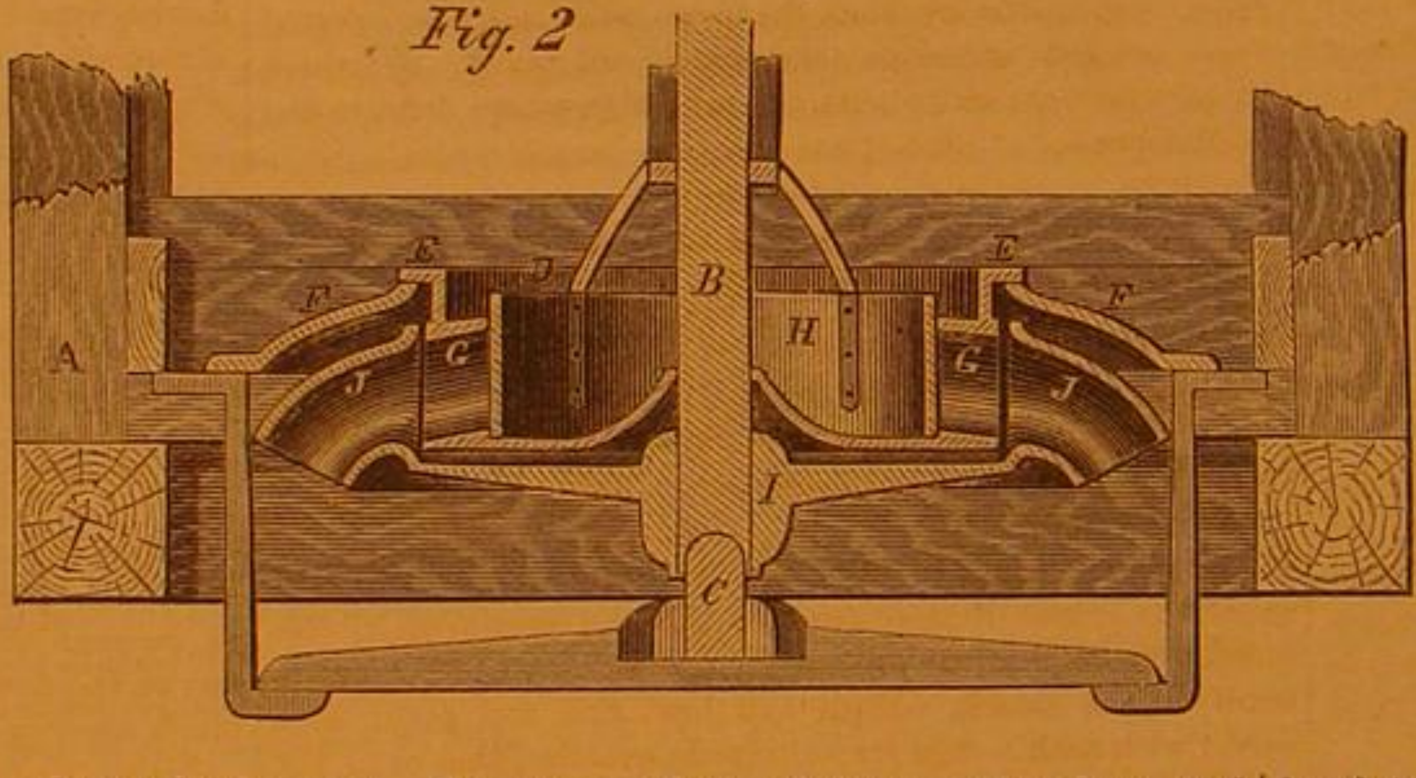
ROLAND'S TURBINE WATER WHEEL.

The chutes are shown at G, Figs. 1 and 2. The gate H, is of hoop form, and is shown closed in Fig. 2. It is opened by simply raising it by a system of vertical rods, and may be placed under the control of a governor to secure a uniform motion of the wheel.

The revolving part, or the wheel proper, is shown at I, Figs. 1 and 2, and the curved buckets of the wheel are seen at J, in both figures.

Thus it will be seen that a very simple wheel has been secured, having but few parts, and so arranged that obstructions cannot break it.

Fig. 2



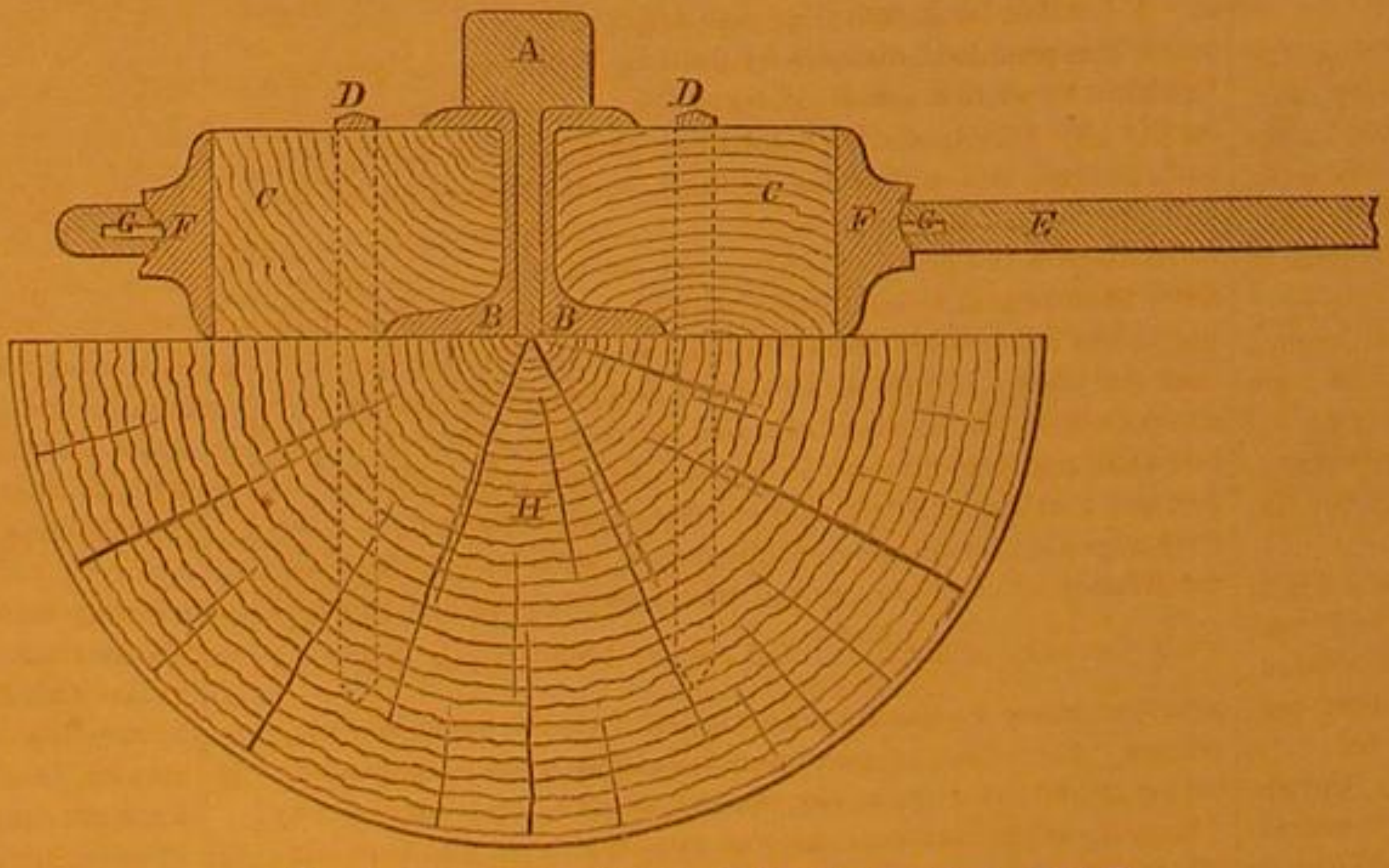
With regard to its power of utilizing the mechanical effect of water, we can only form a personal judgment from its construction, which seems based upon correct principles. The inventor claims that it will utilize more of this effect than any other wheel in use, and he has shown us very flattering testimonials, from parties now using the wheel, corroborative of his personal testimony. These testimonials indicate that the performance of the wheel is not excelled, if equaled, by any other wheel.

Patented, August 4, 1868, by Isaac S. Roland, whom address, for rights or other particulars, Reading, Pa.

Improved Method of Constructing Railways.

The Report of the State Engineer of New York on railroads contains the following statement: "The desirableness, if not the necessity, of increasing the durability of our railway tracks, even to meet present demands, is the truth of all others that our railway managers do not require to be told." And again: "There is a growing conviction among engineers that the longitudinal system will become standard. It offers from 2 to 3 times as much bearing for the rail as the cross sleeper system. The whole strength of the longitudinal is added to the strength of the rail, considered as a beam to carry the load. The strength of the cross sleeper in this direction is wholly wasted. The longitudinal is almost certain to prevent the displacement of a broken rail."

These quotations show the importance of any judicious attempt at devising a perfect longitudinal system. Such an attempt is the subject of the present article, and the nature of the improvement is fully shown in the accompanying engraving.



CHAS. G. WILSON'S PERMANENT WAY.

In this engraving, A is a Bessemer steel rail, resting upon two side rails of iron, B, the forms of which are fully shown in their sections. These side rails fit upon the inner edges of two collateral wooden supports (oak scantlings), C, in the manner shown, and the whole combination thus formed rests upon a longitudinal sleeper, H.

At proper intervals tie rods, E, bind the opposite sides of the track, being firmly held by lining or wedge keys at G. These wedge keys bearing upon the graduated cast-iron washers, F, also serve to clasp and bind together all the parts resting on the sleeper, H. These parts thus bound together are secured to the sleeper, H, by wooden pins or treenails, D.

The advantages of this system have been already partially set forth in the introductory extracts above, but we will, in addition, give the advantages claimed by the inventor—a gentleman who has had twelve years' experience in the construction and maintenance of railway tracks. It is claimed that a railway thus constructed possesses greater strength and gives a better support to the rails. The extended and continuous bearing of the rail prevents its mashing into the wood. By means of the tie-bars, spring keys, and graduated washers, the track is easily kept in gage.

No accident can happen through a broken rail. No part of the track is liable to shake loose, as no fishplates, bolts, nuts, spikes, chairs, or wedges are used. Cross sleepers are entirely superseded. A large reduction of expense in the maintenance of way is attained, and there will be less decay of sleepers, as less surface of wood is presented to the ground. There are no elbow joints in curves, as only one fifth of the rail is at any point non-continuous. The iron rails, if made of good material, will last so long that only their first cost need be practically considered, and the steel rail may wear off as low as the flange of the wheels will permit, and be still as safe to run upon as when first laid. The rails and sleepers being combined in one continuous beam will greatly counteract the heaving of the track by frost in winter as no short undulations can be formed on the line.

Thus a track in every respect superior to the ordinary road is attained; safer, smoother, more elastic, containing fewer pieces per mile, and every joint combining to assist the others in their respective functions; and the reduction of the expense of repairs, both of the way and the rolling stock, will pay ample interest on the additional cost.

Patented through Scientific American Patent Agency, September 14, 1869, by Charles G. Wilson, of Brooklyn, N. Y., who may be addressed for further information.

Why Do Railway Carriages Oscillate?

There is so prevalent an idea that the unpleasant, and, to the nervous, injurious oscillation of railway coaches is due to the axles being too wide for the line, that the following explanation, given in the *Times*, by Mr. Charles Fox, is of much importance, both to the public and the "companies":

"The oscillation of railway trains, more especially at high velocities, producing what is ordinarily called 'gage concussion,' is a very serious source of wear to the permanent way and rolling stock of railways, and, as a consequence, of great expense, to say nothing of the discomfort it occasions to passengers, and is, in my opinion, caused, in very great measure, by the use of wheels, the tires of which are portions of cones instead of cylinders.

"It is well known to engineers that the tires of railway wheels are generally coned to an inclination of one in twenty. It is considered that these were first introduced by Mr. Geo. Stephenson, in the expectation of facilitating the passage of vehicles round curves by their adapting themselves, through their various diameters, to the different lengths of the two rails on which they were running. This, however, is not the case in practice, as any one will find upon carefully investigating the matter, inasmuch as, in a vehicle passing round a curve, the flange of the off fore wheel will be found close up to the outer rail, while that of the aft near wheel will be found running with its flange close up to the inner one, so that no benefit whatever accrues from the use of the cone, even in going round curves.

"The question of passing with steadiness over straight lines seems to have been altogether overlooked in the introduction of coned wheels, for it will be obvious that with the inch 'play' allowed between the tires and the rails, unless one-half of such play be constantly preserved on each side of the way, two wheels, staked upon the same axle, will be running upon different diameters, and, consequently, a struggle arises which cannot fail to result in oscillation, inasmuch as the moment one of the flanges touches a rail, that wheel, becoming larger than the opposite one, turns it off from the rail, only to make the opposite one perform, in its turn, the same operation, when serious oscillation is the result.

"As I have already stated, no advantage is found to arise in the use of conical wheels in passing round curves, and as much evil results therefrom, on straight lines, I have constructed upward of 250 miles of railway abroad, in the rolling stock of which I have departed from the usual form of wheel, and have used only cylindrical ones, and have, as I expected, been gratified with the satisfactory reports I have received of the steadiness of trains supplied with them.

"Now that main-line companies are running their express trains at such high velocities, this oscillation is becoming a very serious matter, not only as a question of safety, but also one of great discomfort to the passengers, to say nothing of the enormous cost occasioned by this destructive action. I would, therefore, venture to recommend, that should any one desire to test the correctness of the principles here stated, he should select a carriage known to be most subject to oscillation, and place under it four cylindrical instead of conical wheels, and let this carriage run in an express train, care being taken to avoid the oscillation of the two adjoining carriages with conical wheels being communicated to it, which would be effected by the introduction of two coupling links, say ten feet long, instead of the shorter ones in general use, and he will at once perceive the advantage of using cylindrical wheels.

"I have a form of tire which I find to answer the purpose very well, a section of which I should be happy to send to any one who may think it worth while to ask for it."

A COLLECTION of twenty-five pins, very well made, has just been placed in the Louvre, Paris. They were found in the subterranean vaults of Thebes, and were made more than three thousand years ago, showing that the modern invention is only a reïnvention.

Scientific American,

MUNN & COMPANY, Editors and Proprietors.

PUBLISHED WEEKLY AT
NO. 37 PARK ROW (PARK BUILDING), NEW YORK

O. D. MUNN, S. H. WALES, A. E. BEACH.

☞ "The American News Company," Agents, 121 Nassau street, New York.

☞ "The New York News Company," 8 Spruce street.

☞ Messrs. Sampson, Low, Son & Marston, Crown Building, 188 Fleet st.; Tubner & Co., 60 Paternoster Row, and Gordon & Gotch, 121 Holborn Hill, London, are the Agents to receive European subscriptions. Orders sent to them will be promptly attended to.

☞ A. Asher & Co., 20 Unter den Linden, Berlin, are Agents for the German States.

VOL. XXI., No. 18...[NEW SERIES.]...*Twenty-fourth Year.*

NEW YORK, SATURDAY, OCTOBER 30, 1869.

Contents:

(Illustrated articles are marked with an asterisk.)

ORGANIC AND INORGANIC SUBSTANCES.

There was a time when certain proximate principles, as the chemists called those substances, found in organized bodies, and which enter into the composition of vegetable and animal tissue, and occupy an intermediate position between the bodies recognized as elements, and fully organized living tissues; there was a time, we repeat, when these complex substances were supposed to owe their origin to something more than ordinary chemical affinity. As usual, in the history of science, when something has been obscure, an occult force was supposed to account for the mystery attending the composition of these substances. The force thus called in was styled "Vital Force," merely a name for an unknown cause or causes.

Chemistry has also been divided into two distinct departments, simply because of the supposed differences between the deportment and composition of organized bodies and inorganic bodies. We say supposed differences. There are striking differences between a living organism and a dead mass of matter; but we are not now speaking of that mystery of mysteries, life; we are not even speaking of living things; only of the substances which enter into and make up the separate parts of living things; parts which, by themselves, do not live, cannot live, but which, together, make up that "unity in multeity," which we call a living thing.

If we cut out a brain or a heart from a living animal, these organs (although manifesting, perhaps, in a more striking degree than any others, the subtile principle of life, so long as they remain attached to the rest of the living organism,) cease to live; become as dead as a sod, or a bough lopped from a tree, nay, die even quicker than the bough; for it is a most singular law of life, that the lower in the scale of animated being an organism exists, the greater is the power of living vested in individual organs.

The heart and the brain, thus isolated, die. Seizing the time before decomposition (which also implies, in every case, *recomposition* "into something new and strange,") sets in, we may subject the substances contained in either, to the most rigid examination without detecting the slightest difference between it and other dead matter, of the same kind, found in minerals or gases.

We are, therefore, forced to the conclusion that no difference exists, in the essential nature of these substances. Just here we encounter a difficulty. The heart or the brain may be fed to other animals, digested and assimilated into new organisms, may even become a part of other hearts and brains in the living animals which devour them.

But if we take the substances of which the heart and brain are composed and resolve them into their elements, and feed them to other animals, we find they are not all assimilated. The phosphorus in the brain may even act as a violent poison, and produce death in the animals to which it is fed.

But were we to stop here, and make, prematurely, the absurd generalization, that no inorganic matters *can be assimilated*, we should have committed a grave error. What is meant by assimilation? It is the conversion of substances taken as food into the substances contained in the body. In other words, *decomposition and recomposition.* This decomposition and recomposition is strictly a chemical process; demonstrated to be so by the artificial production of many organic constituents outside of either plants or animals in the laboratory of the chemist. As a chemical process, it is subject to the same laws as other chemical processes.

One of these laws is, that the occurrence of chemical reactions depends, in part, upon the manner and forms in which substances are presented to each other. For instance: Nitrogen and oxygen, under favoring circumstances, unite to form a series of important acids. Yet they remain intimately mixed in the atmosphere for ages uncombined.

Free sulphuric acid attacks, rapidly, a wooden vessel, and reduces it to charcoal. If, then, we wished to combine a substance with sulphuric acid, in a wooden vessel, without injury to the vessel itself, we should be obliged to present the sulphuric acid to the base in some form in which it would not injure the vessel. Suppose that potash were the substance to be combined with sulphuric acid. Potash, in a free state, also, attacks and disintegrates wood, we should have, therefore, to use the same caution with the potash. We may, however, put into a wooden vessel sulphate of iron, in solution, or bicarbonate of potash without injuring the wood; and if we mix these solutions, the sulphuric acid of the sulphate of iron will unite with the potash in the bicarbonate of potash, and the combination we sought will be effected.

Could we now suppose an animal with a wooden stomach, it is evident that sulphuric acid, by itself, or potash, by itself, would be a corrosive poison to that animal, but that sulphate of iron or bicarbonate of potash would not be. The digestive apparatus of plants is made up of woody tissue, and either of the two former substances, in a free concentrated state, is a poison to plants, yet one of them, potash, is an essential element of nutriment in the growth of plants.

Phosphorus is an essential element to animal growth. We have stated, that, presented in a free state, it is a poison, yet, in a combined state, it is an important constituent of the most valuable articles of food. When we analyze these articles, we find that there is no difference in the phosphorus salts contained in them, from the same salts made directly in the laboratory.

When taken into the stomach in the same state of dilution or mixture with other materials, the natural salts are no more readily assimilated than the artificial, if, indeed, it be proper to make any distinction of natural and artificial in these salts, where both are formed in strict obedience to the same natural laws.

Who, then, can point out the real distinction between organic and inorganic matter. One of the ablest chemists of the age, Dumas, has recently declared, in a public lecture, that there is no such distinction.

It may be granted that there is a structural peculiarity in an organic substance not to be found in crude mineral substances, but the ingredients are all to be found in the mineral kingdom. How this structural form is produced is the problem with which modern biologists are now grappling, and present indications are, that the cause will finally be referred to one general formative tendency in all matter, by which not only animals and plants, but crystals assume definite and specific forms.

THE VELOCIPEDES OUT AGAIN.

The first serious attack of the velocipede epidemic in this country set in during the closing weeks of winter. It raged with great violence during the spring; but the hot weather, which seems to favor other epidemics, threw cold water on this, and by the middle of July a velocipede was rarely seen in our streets.

Just as we began to turn our two-wheeled steeds out to grass, the British Empire awoke to find the fever upon it. No quarantine regulations or sanitary precautions had sufficed to ward off the attack. High and low, rich and poor, were seized with such a rage for velocipede exercise, that even the gravest engineering periodicals and papers felt themselves obliged to say something on the subject. *Engineering* and the *Engineer* held off as long as possible, but were obliged to give in finally to the popular *furore*. *Engineering*, at the outset, made some remarks upon the extent of the popular demand for velocipedes, but dropped the subject almost immediately. Another mechanical journal copied in full our editorial on the "Mechanics of Walking," and forgot to credit it. A London book compiler also appropriated it. The *Engineer* compromised matters by getting Professor J. Macquorn Rankine to write a series of recondite mathematical articles on the gay velocipede, with formulæ long enough for a velocipede course, and numerous enough to accommodate all the velocipedes in England.

To discuss the topic in any other style than this, would have been beneath the dignity of this journal, which is nothing if not scientific. Nevertheless, we are willing to admit that the keen analysis of Professor Rankine has evolved subtile points of philosophy from the bones and marrow of our pet, that make us more in love with it than ever. While our feet are moving in lively and exhilarating motion, our mind may now also be actively employed in meditating upon the "deflection of the base track," which is expressed by the neat little formula: $PM=\frac{mPv^2}{g.cm}$ but out of which issue forth an army of sines, co-sines, tangents, and logarithms. We may reduce "the effect of *(our)* unskillfulness upon oscillations," into a triple equation of the second degree, and correct our "horizontal oscillations" by the application of the formula: $\frac{gy}{v^2p}$ which Professor Rankine has so kindly bestowed upon mankind, and which once stored up in the head of a velocipede rider will forever effectually prevent a loss of balance in his body, whatever may be the effect upon his brain.

Could we have had Professor Rankine's formulæ to guide us at the outset of our velocipede experience, how many bumps and bruises we might have spared ourselves. How easy it would have been when we found ourselves sprawling and with painful effort extricated ourselves, vainly endeavoring to exhibit no sign of discomfiture, to have avoided such humiliating defeat by such an adjustment of our co-sines, as would have prevented our flying off in a tangent to the "arc of progression." Truly, as Solomon averred, "wisdom is profitable to direct."

But while the velocipede has been doing so much in England, it has been recuperating itself for a fresh run in America and we already see many of these machines in active operation on smooth pavements not yet opened to travel for larger vehicles. The velocipede is not dead, but will, this cool and delightful autumn weather, once more resume its sway, though to what extent it may conquer is yet to be recorded in history.

THE EXHIBITION OF THE AMERICAN INSTITUTE.

Our last visit to the Fair of the American Institute took us first among the pumps, of which there is a considerable variety displayed. We find no marked advance in this department of engineering since the exhibition of 1867, but we will briefly mention the most important of the pumps exhibited.

The Woodward Steam Pump Manufacturing Co., of New York, exhibit one large single cylinder, and one large double cylinder steam pump with several small ones of their manufacture, the construction of which is too well known to our readers to render details necessary here. They also display a novel steam pump called the "Little Giant." The pistons, both of steam cylinders and of pump cylinders, remain stationary while the cylinders travel. It is a double-acting pump—all the cylinders are vertical—and it occupies very little space. Its valves are cylindrical, and consequently balanced, and it is said to work very economically.

Knowles & Sibley, of New York, exhibit some beautiful pumps, the workmanship of which is of a superior kind. The main steam valve of these pumps is carried over the center by means of an auxiliary valve of peculiar construction, the action of which is extremely delicate, rendering these pumps as suitable for boiler feeders, where a very slow motion is required, as for work requiring their fullest capacity. It will be unnecessary to dwell upon the special merits of these pumps as they are well known to all American engineers.

The steam pumps shown by Geo. F. Blake & Co., of Boston, is also a good one, exhibiting many points of merit, and excellently made. The steam valve is balanced, and it will start at any part of the stroke.

The Emery Rotary Machine Co. exhibit Novarro's rotary pumps, the principle of which is the thrusting out and in of flat buckets by the alternate action of a fixed eccentric ring surrounding the shaft of the motor wheel and the case; the wheel and fixed eccentric being concentric with each other but eccentric to the case. This pump is also a motor-wheel or a water-meter, by making it a propelled wheel instead of a propeller.

J. H. A. Gericke, of Jersey City, N. J., exhibits his turbinate force pump, which is essentially a centrifugal pump.

T. F. Rowland, of Greenpoint, Brooklyn, N. Y., also shows a powerful centrifugal pump, which is very simple in construction, and is so little liable to obstruction, that it may even be used for dredging.

Philip S. Justice, of New York and Philadelphia, exhibits one of the pumping engines described and illustrated on page 33, current volume of the SCIENTIFIC AMERICAN, which is one of the novelties among this class of devices, and attracts much observation. It is making a favorable impression.

Berhen's rotary engine and pump, exhibited by H. C. Dart & Co., of New York, is for many purposes doubtless as good a rotary pump as any present at the Fair, and it attracts much favorable comment. One of them is in operation as a boiler feeder, a kind of work which it does in a superior manner.

The Niagara Steam-pump Works, of Brooklyn, N. Y., exhibit the well-known Niagara pump and engine, the arrangement of valves in which is admirable. The valves may be reached, all obstructions—if any chance to be present—removed, the valves replaced, and the pump set to running in a very short space of time. All that is necessary to get at the valves is the removal of a single nut. This pump has acquired a deservedly good reputation.

Wm. D. Andrews & Bro., of New York, exhibit their central-discharge centrifugal pump, and their patent improved anti-friction pump. Important improvements have been added to the latter recently. The piston is balanced by a series of holes in the piston itself, by which the pressure may be equalized on both sides of it, and the induction wing used formerly on these pumps is dispensed with. This pump is of great capacity and its operation excites much attention.

From pumps to

BLOWERS,

which may be regarded as a species of air pumps, the transition is natural. There are only a few of these on exhibition. There are two kinds of fan blowers, each of which are great improvements over the original fan blower of Ericsson & Bathwaite, constructed in 1829.

The most important of these is the multiplying pressure fan blower, invented and exhibited by P. Clark, of Rahway, N. J. All methods employed to attain increased pressure without increase of speed, except this, have proved unsuccessful to a greater or less degree. This blower is made up of a series of fan wheels all attached to a common shaft, and running at the same speed, but in different compartments, communicating only by an annular space surrounding the shaft, of sufficient capacity to permit the flow of air from the first compartment to the second, and so on. The rotary motion of the air acquired in each compartment is checked by a fixed turbinate arrangement of curved buckets, which change the direction of the current and conduct it through the annular space above alluded to, when the next fan in order takes it and gives it additional pressure, and so on to the end of the series. Water gages attached to each compartment show that the pressure is uniformly increased in each compartment. It is thus the required pressure may be obtained without excessive speed. This blower, as being one of the few novelties of the machinery department, attracts much attention from mechanical visitors to the Fair.

The pressure blower exhibited by B. F. Sturtevant, of Boston, Mass., is also a good blower, running without great noise and performing good work. This blower has been before the public so long, and is so favorably known that we need not dwell upon its details.

A machine of an entirely different class is Root's patent force-blast rotary blower, exhibited by S. S. Townsend, of New York, the construction of which can hardly be explained without diagrams. It gets up a strong blast with slow speed, the air being impelled by absolute pressure. The weight of the moving parts is light, they being composed chiefly of wood, and very little power is absorbed in friction. There are no valves, and the parts of the machine are very few in number. The same principle is applied to hand blowers, of which there is one on exhibition—a very convenient and effective substitute for the old-time blacksmith's bellows for forges.

Besides the pumps mentioned, exhibited by Wm. D. Andrews & Bro., of New York, that firm also exhibit their patent

OSCILLATING ENGINES,

by which their pumps are operated. They also show one of their friction grooved hoisting machines, with oscillating cylinder and direct connection of the piston rod and crank. Motion is, in this machine, communicated to a wheel and axle by grooved friction pulleys. It therefore runs without noise, and the speed is perfectly controlled.

A novelty in

STEAM GENERATORS,

not on exhibition at our previous visit, is exhibited by Thomas Mitchell, of Albany, N. Y. It is a cylinder of wrought iron with welded joints, into which water is thrown by a feed pump; the same pump operating through a worm gear to slowly rotate the cylinder in the furnace where it is suspended upon two journals, one at either end of the furnace. The design is to only throw water into the revolving generator, as wanted, to make steam. The steam is generated under very high pressure. The water is injected through a core pipe in one of the journals which extends longitudinally through the axis of the cylinder, and is perforated at intervals throughout its length. The water is thus subdivided into small jets, which the heat of the cylinder converts into steam instantaneously.

In one corner of the floor devoted to the exhibition of machinery stands two beautiful machines displayed by S. R. Krom, of New York, one of which is an ore crusher and the other a dry ore concentrator; both these machines exhibit a degree of mechanical and inventive skill highly creditable to their inventor. The crusher munches up large lumps of the hardest ores, with as much ease as a boy could crack a hazel nut, while the concentrator separates the ores from the gangue with great rapidity and certainty. The prominent feature of this machine is the use of intermittent puffs of air, which renders available whatever difference there may be in the specific gravity of the ore and its gangue. The construction of the machine is based upon sound scientific principles, and will well repay inspection. In the

DEPARTMENT OF INTERCOMMUNICATION.

there is very little worthy of mention. There is, however, a model of a turn-table exhibited by James B. Kelly, of Kendallville, Ind., which turns on car wheels of the ordinary constructions, rolling between concentric tracks on the under side of the table and corresponding tracks upon which the wheels rest. The wheels are kept at their proper distances by radial shafts upon which they play almost without friction, as these shafts bear no part of the load. The model works with remarkable ease, and we judge the principle might be advantageously applied to drawbridges, locomotive turn-tables, etc.

A novelty in this department are the

PAPER BOATS,

exhibited by A. Waters, of Troy, N. Y. They are beautifully finished and astonishingly light. The largest one exhibited, capable of carrying 170 lbs., only weighs 32½ lbs. These boats attract much attention.

We take this occasion to notice a

STEAM FIRE ENGINE

exhibited by Cole Brothers, of Pawtucket, R. I. It is finished in a high style of art, and has some peculiarities of construction worthy of note. The piston rod is forged solid, by which cramping of the link block is obviated. The pump is always charged from the outlet by means of the siphon form of the suction pipe. These engines are guaranteed to draw water twenty-nine feet. They are compact and built to combine strength with lightness, so far as this is practicable.

Near this fire engine stands an

ELECTRO-MAGNETIC ENGINE,

in which there is no new principle displayed, but the application of which to the driving of sewing machines attracts a great deal of attention. The motion is uniform and sufficiently strong for the purpose, and we were told that the expense of maintaining the battery was only ten cents per day.

In passing from the building we notice one of the best things we have seen at this Fair, namely, Poulson's patent lazy-tongs

SHUTTER BLIND AND AWNING,

made entirely of metal, and worked from the inside by a crank. When open they are entirely out of sight, and when closed they are burglar and fire proof. They can be adjusted to admit light and air and exclude the sun. The awnings are supported by brackets from the wall, and are adjusted in the same manner as the blinds. They are simple in construction, not liable to get out of order, not materially more expensive than the ordinary awnings and fixtures, and in our opinion far superior to any thing of the kind hitherto used.

NEW FACTS ABOUT THE FORMATION OF DEPOSITS IN STEAM BOILERS.

It is generally considered that water containing carbonate of lime is less injurious for feeding steam boilers than such with sulphate of lime in solution, inasmuch as the latter shows more tendency to form a hard and adhering incrustation. Albeit deposits of this character have been analyzed that present a considerable percentage of carbonate of lime, their number is few in proportion to those in which the greater part of lime is known to exist as a sulphate. The addition of carbonate of soda to selenitic waters, as those of the latter class are termed, has at least proved to be an effective means, inasmuch as it causes the formation of a muddy deposit, which, upon analysis, proves generally to be a carbonate. Be this as it may, it is important for us to know, that waters with but carbonate of lime in solution may lead to injurious consequences under circumstances that were unknown heretofore. Reports in our foreign cotemporaries inform us that cases of this kind have occurred in Switzerland, since the firing of boilers with coal in that country has become more universal. Old as well as new Cornwell and Fairbairn boilers were seen to become red hot, while the water gage indicated several inches of water above the fire space. They got out of shape in such a way that they had to be removed and replaced by new ones.

Satisfactory information upon the subject is due to Prof. Bolley, in Zurich, who in various instances was called upon as an expert. The first case occurred in the Canton of Zurich. The feeding water was hard, but otherwise pure; it contained but traces of organic matter and no sulphates. The mineral ingredients left behind, upon evaporation were found to consist of 81·84 per cent of carbonate of lime. It had settled as a white gray powder and in considerable quantities. If thrown upon water it remained floating upon it; it did not get moist, and remained dry even when in contact with boiling water for some time. When exhausted with ether, a small amount of fatty matter separated, and this gave the clue to the disturbance mentioned.

This pulverulent deposit covered the boiler plate to the hight of several inches, so that the water could not come in contact with it. The fatty matter was sufficient to surround the particles of the carbonate of lime with a thin layer, in this way causing them to float upon water if this was not subjected to pressure.

Whence did this fatty matter originate? At the very beginning it had been supposed that it came from the waste water of a neighboring bleaching establishment that flowed in the river a short distance above the spot where the feeding water was taken. Indeed, on examination, it was found that the bleaching liquid contained a small amount of fat, but whence this was derived could not be ascertained.

Another case of this kind occurred in the Canton of Thurgovia. The deposit in question exhibited the same characteristics as described above. Upon being subjected to distillation in a retort with a small surplus of sulphuric acid, a very distinct odor of butyric acid could be perceived. One half a pound of the material in question was then boiled with distilled water and under addition of a little soda. In this way an alkaline solution was obtained with the fatty substance in solution. On filtering it and adding some muriatic acid butyric acid could also be perceived. At the same time small fat globules were recognized that did not disappear on diluting with water; on taking them up with ether, and evaporating, an odorless oily substance was left behind. When Bolley had recognized butyric acid, the opinion was entertained by him that it originated from the water, as this acid is often met with in water arising from peat moors. But when he had detected fat, of which butyric acid is a constituent part, this opinion was abandoned, and now it was ascertained that the condensing water served to feed the boiler. The fat was probably derived from the lubricating oil.

When some soda was added to the feeding water no dry deposit was observed, and this was also the case when the condensing water was not employed for feeding. At any rate it is important to know that a small amount of fat in water that contains earthy carbonates, but no sulphates, may produce a dry instead of a muddy deposit. However, it is quite strange that this was not observed before, as the inside of boilers is sometimes rubbed over with fat, which is supposed to protect them from incrustations. With regard to the fuel, it is self-evident that it can not have any influence upon the formation of deposits. However the plates will become sooner red hot when coal instead of wood is used.

It may yet be remarked that recent investigations have revealed the fact that butyric acid is of a more common occurrence in the soil and in water than hitherto supposed. Pierre detected this acid in soil that had not been fertilized for four years; it was also met with in the pond of a farm. On examination it was discovered that it had originated from putrescent sugar beets in which it often appears. Besides, it is known that straw and the food of cattle yield sugary elements that are more or less convertible into this acid.

Several cases of similar powdery deposits have recently come to our knowledge in this country; and we have received several specimens corresponding almost exactly to those described as having occurred in the boilers in Switzerland, and probably resulting from the same causes.

THE PRESERVATION OF IRON.

The great enemy of iron when used in architectural or engineering work is oxygen. We would not be understood to ignore other causes, the tendency of which is to hasten the destruction of bridges, etc., such as expansion, the production of a crystalline state of the metal by vibrations, etc., but these causes apply only to special cases, while in all cases, unless something interferes, oxygen slowly but surely gnaws away at every bit of iron exposed to its action.

A great many methods have been employed to prevent the rusting of iron, by which is meant its chemical union with the oxygen of air, water, or other medium in which it may be placed. In the case of saline waters, the reactions are more complicated, but the final result is the same, namely, the oxidation and disintegration of the metal. Unprotected iron rusts away much faster in such waters than in common air; but exposed to the action of the ordinary substances, to be found in all places where structures of iron are located, the ultimate destruction of such structures is merely a question of time.

But while the vibratory motion of iron tends to render it brittle, and change its physical character from a fibrous to a crystalline material, such motion acts, in some yet unexplained manner, to combat the affinity of oxygen for iron. Hence the old proverb that "the used key is always bright," has more foundation than the polishing effect of wear.

In machinery it is common to paint or otherwise protect the stationary parts, while the moving parts have been found not to require much protection, when properly shielded from damp. In many cases castings will stand in a shop just as they have been taken from the sand, without rusting, being protected by a thin film of silica from the melting of the sand during the process of pouring, but as soon as exposed to the action of water this protection fails, and they rapidly become coated with rust.

The processes most generally applied to shield iron from the action of oxygen, have for their object the isolation of the metal from this gas.

The coating of iron with metals is one of the most important of the means employed for this purpose; tin and zinc being the metals most frequently used. But these metals will not permanently protect iron in all situations, and they cannot in many instances be applied.

Another class of substances are paints, tar, linseed oil, etc., which form coatings upon the surface of iron and thus isolate it from oxygen. None of these can, however, be relied upon as a permanent protection; and they have to be from time to time renewed, upon parts where the metallic surface has become exposed. It has been regarded by some as quite doubtful whether any cheap and practicable method for the prevention of iron rust, that will permanently secure this object can be devised, yet it would seem, with all the great resources of modern chemistry, this problem should be capable of solution.

As yet iron cannot compete with stone in structures designed to endure the effect of time, without repeated attention to keeping its surface covered with some protective covering; and until it is enabled to do this by some improvement in methods of protection, its use for engineering and architectural purposes can never entirely supersede that of stone, if, indeed, it can ever compete fully with stone in other respects. What is wanted is something equally applicable to large or small pieces of iron, and which will answer to ward off the attacks not only of the common atmospheric oxygen, but will also remain unaffected by acids or salt waters. Who will give this to the world?

THE WATERING OF THE STREETS OF NEW YORK WITH SEA WATER.

At intervals, for a period of two years, we have called public attention to the method of watering streets with saline solutions, now practiced in parts of London, in Liverpool, and other cities of England, with the most satisfactory results. Our efforts to force the advantages secured by this method upon public attention, have been seconded, so far as we are aware, by no other paper in this country. We have, however, this season been helped by a strong natural ally—the drought.

The scarcity of Croton water, which, but for the timely October storms, would have placed the city in danger, has aroused the authorities to the fact that "something must be done."

It is now proposed by the engineer of the Metropolitan Board of Health, to water the streets of New York with sea water, the water to be raised by pumping.

While there are certainly no insuperable engineering difficulties to be surmounted in carrying out this project, the expense it will entail upon the city will prove a serious obstacle to its adoption; and after all, though approximating perhaps in effect to the method above alluded to and which we have recommended, we do not believe it could ever be so economical or effectual.

We have not room to give this week, an abstract of the important report in which the plan under consideration is recommended to the board.

Would it not be wise for the Board of Health to try the English plan in some section of our most dusty thoroughfares—an experiment which could be made thoroughly at an expense of less than two thousand dollars for an entire season—before deciding to favor the report of their engineer?

The entire concurrence of the English press in the economy, comfort, and sanitary effect of their method, warrants a trial of it in American cities, and the sound scientific principles upon which it is based should also claim for it attention from the able men who compose the Metropolitan Board of Health.

PROGRESS OF AMERICAN WOOLEN MANUFACTURES.

The proceedings of the Fair of the American Institute were diversified on the evening of Oct. 5th, by an able address, delivered by Erastus B. Bigelow, President of the National Association of Wool Manufacturers.

We regret that pressure upon our columns forbids our giving more than an abstract of the address.

After some introductory remarks, the speaker went on to say that this exhibition of American woolens is the first instance of any attempt in our country to bring before the public eye, in one great collection, the characteristic products of a single industry. We can, I trust, honestly say that it is prompted by a higher motive than that of ambitious display. In no other way can the progress, the extent, and the value of such an industry be so effectually shown. No statements or statistics can be so impressive and convincing as the visible evidence which is furnished by an exhibition like that now before you. It is the next best thing to actually visiting the manufactories from which these fabrics come. Could you pass through the great establishments so honorably represented here, and look on their busy wheels and cards and spindles and looms—their myriads of thrifty, happy working men and women, the huge masses of raw material which they work up, and the countless car-loads of finished fabrics which daily leave the mills, you would need no argument to assure you that the woolen industry of the country is second to no other, whether individually or nationally considered.

The annual value of our woolen manufactures, and of those manufactures in which wool is a component part, is not less than $175,000,000. Of these goods more than four fifths are made from American wools. The coarse carpet-wools, which are not grown here at all, the worsted combing-wools, and the fine clothing-wools, which are grown by us only in limited quantities, go to make up the rest.

In relation to the articles now brought out under the direction of the National Association, it is only proper to state that none of them were made specially for this occasion, or appear as candidates for prize awards. They are the usual products of the mills, such as are got up for the general market, and they are here not for individual gain or glorification, but rather to show the quality and variety of our wool fabrics, and the extent to which they supply, or can supply, the wants of the American people. The fine quality and the beautiful finish of many articles in this collection cannot fail to arrest attention. Yet the real significance of the display is to be seen, not so much in this as in the wide range and diversified character of the fabrics, in their soundness, and their fitness for the uses intended, and in the low prices at which they can be furnished. For instance, in no market of the world can better cassimeres be found than some of those which are here exhibited. These meet the demands of one class in the community, while the wants of another and far more numerous class are met by clot is equally excellent, because equally adapted to the use for which they are designed. I have selected a particular case, but this remark has a general application.

This display of woolen fabrics is instructive, as showing the great advance which a comparative y short period has effected in the diversification of our wool manufactures. Ten years ago, our manufacturers had attempted scarcely any thing beyond common goods of the coarser kinds. Now they produce almost every variety of wool fabric in general use. Among those which are now successfully made here, but which are comparatively new as American productions, I may mention lastings, bunting, worsted reps, and serges for furniture covering, worsted furniture damask, Italian cloths, worsted popling, mohair lustre, cashmeres, merinos, Astrachans, chinchilla cloak'ngs, Scotch cassimeres, embroidered table-covers, Axminster carpets.

The annual consumption of woolon goods in the United States may be put in round numbers at $240,000,000. In 1868, for instance, we imported woolen goods as follows:

Cloths and cassimeres	$6,956,449
Shawls	1,559,999
Blankets	28,196
Carpets	2,766,291
Dress goods	15,196,233
Manufactures not specified	5,902,591
	$32,409,759

The above figures, it must be remembered, represent the foreign valuation as expressed in gold. In comparing the value of woolen goods imported with the estimated value of our home productions, we must add to that valuation the customs duties, the premium on gold, and the profits of the importer. With these all on, the value of sales in first hands is fully double the amount of foreign valuation. If now to $175,000,000, the estimate of our domestic product, we add $64,819,518 for the sales of imported woolens in first hands, the result is $239,819,518. Thus it appears that our own manufactures amount in value to nearly three quarters of the whole.

Notwithstanding the unquestionable and the generally acknowledged excellence of our wool manufactures—a fact which this exhibition fully demonstrates—those manufactures still suffer, more or less, in the market, from prejudices and prepossessions alike ill-founded. A preference for fabrics of foreign origin has very naturally come down from the time, not very distant, when our domestic products were generally inferior. Of those who now habitually insist upon buying the foreign article, some are honestly ignorant. They are not aware of any improvement in American manufactures. With others, it is the merest aping of a senseless fashion. But the delusion could not be long kept up, were it not for the interest of the dealer to sustain it. It is easy for him to make a larger profit on the imported article, from the fact that its probable cost is not so generally known. In many instances the temptation is so strong that truth, honesty, and patriotism make their appeal in vain. Not only are American productions systematically disparaged, but, in a multitude of instances, these very productions are labeled as French, English, or German. The extent to which this imposition is carried is known only to those who are let into the secret. There are, probably, very few of us who have not thus been taken in. And, what I am inclined to regret as the most melancholy thing of all, is the unquestioned fact that some of the manufacturers themselves have consented to the deed. I suppose the process by which such a bargain is consummated to be somewhat as follows; A manufacturer, after much toil and outlay, is prepared to introduce a fabric not before made here. He finds the market, however, fully supplied with the foreign article. Those who hold it give him no encouragement, for they know that the introduction of the domestic product must lessen their chance for high profits. Between him and the consumer (who must be reached somehow, or his enterprise fails) stands a class of men whose interest it is to sell foreign rather than domestic goods. The result is a compromise. Says the dealer to him, "I like your goods, but I cannot sell them as American. Give them a foreign brand, confine the product of your mill to me, and I will take all that you produce." The poor manufacturer, seeing no alternative, closes the unhallowed bargain.

It will be strange if this exposition of our wool manufactures does nothing toward correcting these mistaken ideas in regard to the inferiority of American fabrics which are entertained by so many. It shows the great and respectable body of American manufacturers that there are those among them who have no need to sail under borrowed colors, and who, under any circumstances, would scorn the thought. It is a silent but eloquent rebuke to those dealers in such fabrics who, to promote their own selfish aims, are wont to decry and deride everything that is home-made. And, finally, it appeals to the great class of consumers, and bids them be candid when they buy, even if they cannot be patriotic.

It has been through a long series of difficulties and discouragements that our wool manufactures have attained to their present advanced condition. Not the least of these impediments has been a vacillating tariff. In this respect the policy of our government has been sometimes friendly, sometimes decidedly hostile. The tariff of 1846, which imposed upon wool a higher rate of duty than some of its manufactures paid, proved especially adverse. Under its baneful operation the growing of wool remained almost stationary, and many of the largest manufacturing companies became bankrupt.

Mr. Bigelow closed his address with an able review of the subject of free trade, showing the fallacies of the doctrine in the present condition of the world, and comparing its advocates to the advocates of a universal peace, something very desirable, and to be looked for with hope, but at the present day utterly out of the question.

OBITUARY---CHARLES B. HUTCHINSON.

The Auburn, N. Y., *Advertiser* publishes a long and glowing eulogy upon the life and character of C arles B. Hutchinson, who died in that city, on the 9th of October, at the age of 50 years.

Mr. Hutchinson possessed a marked genius, and was constantly occupying his mind upon some new and useful improvement. The records will show that he had secured about twenty patents; and we are pleased also to record the fact that he was successful, and had accumulated a handsome reward for his ingenuity and business capacity.

Our acquaintance with Mr. Hutchinson began nearly twenty years ago, and we can bear testimony to his high and manly qualities of head and heart.

Curious Stereoscope Effects.

In the stereoscopic views one image of the view is superposed on the other and produces the effect of relief. If we tint one of the views with a transparent color, such as cobalt blue and the other with carmine or lake, we have the combination of these colors in the stereoscope, viz., a purple tint; and so with regard to the colors to produce various shades of green, brown, etc. The colors thus employed produce remarkable effects by their transparency; and to see a view first with one eye in one set of tints, and then with the other in a different set of tints, and then with both eyes to see a third and differently colored picture, is an optical effect as instructive as it is amusing. We, in fact, combine the colors in the eyes instead of the color-cups.

A GERMAN photographer has invented a method of making seals and stamps with the portraits of his customers. A thin layer of gelatine, sensitized with bichromate of potash, is exposed to the action of light under a photograph positive, by which the parts acted on are rendered insoluble in water. The gelatine film is immersed in water, and the parts not acted on by the light swell up, and we obtain a picture in relief of which a plaster cast can be taken. A galvanic plastic copy being taken of the cast, we have a metallic facsimile of the photograph, which can be employed as a seal. This process suggests a method of obtaining perfect likenesses of persons in metallic checks for the use of the printer, and also an admirable way of illustrating scientific books.

THE latest advices with regard to the progress of the Suez Canal are to the effect that the Bitter Lakes had been brought up to the level of the Mediterranean, and that M. Lesseps, the engineer, had gone through the whole length of the canal in a steamer. The completion, however, of the rest of the works in time for the proposed opening on the 17th of November is still considered in some degree uncertain.

Coloring of small Metallic Objects.

M. Puscher, a German chemist, gives the following receipts for the application of sulphur to the purposes referred to. 1. A solution is made in the following manner: Dissolve 4 oz. of the hyposulphite of soda in a pint and a half of water, and then add a solution of 1 oz of acetate of lead in the same quantity of water. Articles to be colored are placed in the mixture which is then gradually heated to boiling point. The effect of this solution is to give iron the effect of blue steel; zinc becomes bronze, and copper or brass becomes, successively, yellowish red, scarlet, deep blue, light blue, bluish white, and, finally, white, with a tinge of rose. This solution has no effect on lead or tin. 2. By replacing the acetate of lead in the solution by sulphate of copper, brass becomes first of a fine rosy tint, then green, and, finally, of a iridescent brown color. Zinc does not color in this solution; it throws down a precipitate of brown sulphuret of copper, but if boiled in a solution containing both lead and copper, it becomes covered with a black adherent crust, which may be improved by a thin coating of wax. If the lead solution be thickened with a little gum tragacanth, and patterns be traced with it on brass, which is afterwards heated to 212 degrees, and then plunged in solution No. 1, a good marked effect is produced.

Inventions Patented in England by Americans.

[Compiled from the "Journal of the Commissioners of Patents."]

PROVISIONAL PROTECTION FOR SIX MONTHS.

2,518.—COFFIN.—J. D. Nietscke, Somerset, Ohio. August 24, 1869.

2,633.—PIANOFORTE.—T. King, West Farm, N. Y. September 7, 1869.

2,635.—PREVENTING THE RADIATION OF HEAT FROM STEAM BOILERS.—C. M. O'Hara, New York city. September 7, 1869.

2,639.—KNITTING MACHINE.—C. A. Shaw, Biddeford, Me., and J. Hinkley Norwalk, Ohio. September 8, 1869.

2,578.—MEANS FOR EXTINGUISHING FIRES AND WATERING STREETS.—T Bigelow, Brooklyn, N. Y. September 13, 1869.

2,693.—COMBINED BUCKLE AND BUTTON-HOLE.—L. A. Kettle, Philadelphia, Pa. September 15, 1869.

2,691.—MEANS FOR BURNING SOLID FUEL.—L. A. Kettle, Philadelphia, Pa. September 15, 1869.

2,697.—MACHINERY FOR THE MANUFACTURE OF FELT AND OTHER CLOTHS.—J. T. Sanford, New York city. September 15, 1869.

2,698.—STEAM AND CALORIC ENGINE.—Alex. Hendry, Victoria, British Columbia. September 15, 1869.

Recent American and Foreign Patents.

Under this heading we shall publish weekly notes of some of the more prominent home and foreign patents.

Harvester.—R. M. Williams, Rockville, Md.—This invention consists in attaching the finger bars and platforms to the framework of the machine in such a manner that said finger bars and platforms may rotate about a common center in a horizontal plane.

Horse-Power.—Geo. W. Moyers, Gordonsville, Va.—This invention consists in arranging the line shaft under the power wheel in such manner that the former may be vertically adjusted with reference to the latter, without removing the power wheel, or in any manner interfering with it.

Cotton and Hay Press.—Wm. C. Banks, Como Depot, Miss.—This invention relates to an improved arrangement for operating the movable supporting block, and an improvement in the construction and application of the metallic plates attached to said movable beam against which the rotating screw nut bears.

Cotton Chopper and Scraper.—H. B. Cage, Madison Station, Miss.—The object of this invention is to provide for public use a simple and cheap cotton chopper and scraper, so constructed that the chopper shaft can be conveniently removed and the instrument then used either as a scraper or ordinary plow.

Fire-proof Paint.—Emil Kunzendorf, New York city.—This invention tion relates to a new composition, which, when applied to wood or other combustible matter, will render the same comparatively fire-proof. The invention is applicable to all buildings, and all combustible matter, as a roof paint, and wherever fire-proof qualities are required.

Supporting Bars for Vehicles.—James B. Brewster, Flushing, N. Y.—This invention has for its object so to strengthen all kinds of supporting bars for wheeled vehicles and sleighs—that is to say, axle beds, bolsters, fellies, and sleigh runners, that the same will not be liable to split or break, nor to yield in the direction in which the greatest strain is applied.

Machine for Planing and Molding.—Frank Douglas, Norwich Town, Conn.—The object of this invention is to provide for public use a machine for planing and molding, in which the several parts are more perfectly and readily adjustable than heretofore, so that it can be operated with increased convenience, while, at the same time, it is adapted to a greater variety of work.

Combined Pipe Tongs and Wrench.—V. K. McElheny, Pittsburgh, Pa.—This invention consists in combining with a main stem, having a fixed jaw at one extremity and a handle at the other, a movable jaw, held by a band upon one side of said stem, and a lever, with a sliding fulcrum, for operating said movable jaw, upon the opposite side of said stem.

Folding Chairs.—E. W. Vaill, Worcester, Mass.—This invention consists in attaching rigid arms, pivoted at both ends, directly to the rigid seat of a folding chair, when such seat has slots in its sides for the reception of pins in the upper ends of the short legs, so as to allow the latter and the rigid seat to be folded back compactly against the back posts of the chair.

Binding Attachment for Reaping Machines.—J. H. Mudgett, Camanche, Iowa.—The object of this invention is to provide a simple and efficient binding attachment for reaping machines, which will secure the grain from the reaper and present it, in bunches or gavels, to the attendant, and place the binding cord in a convenient position, to enable him to tie it quickly and discharge the sheaves, so bound, into a carrying rack, where they are retained until a sufficient number accumulates to form a shock, when they may all be discharged together by the pulling of a trip catch.

Hydrant and Stop-Cock Rods.—Henry Rausch, Brooklyn, N. Y.—This nvention has for its object to furnish an improved hydrant and stop-cock rod, which shall be so constructed and arranged as not to be liable to be detached when removing the key, and at the same time stronger and not so liable to be eaten away by rust and broken as when constructed in the ordinary manner.

Hames Fastener—A. J. Tompkins and J. M. Wegand, Clarksville, Iowa.—This invention has for its object to furnish a simple, convenient, and reliable adjustable hames fastener, designed especially for fastening the lower ends of the hames, but which may be used with equal facility for fastening the upper ends of said hames.

Combined Seed Sower and Cultivator.—John W. Doud, Ward's Corners, Iowa.—This invention has for its object to combine with the improved cultivator, patented by the same inventor January 7, 1868, and numbered 73,173, a broadcast seed-sowing attachment, which shall be simple in construction, and so constructed and arranged as to do its work accurately and well.

Base-Burning Stove.—Robert Batting, Albany, N. Y.—This invention has for its object to furnish an improved base-burning stove, or heater, which shall be so constructed and arranged as to furnish a greater amount of heat from the same or a less quantity of fuel than is possible with stoves constructed in the ordinary manner.

Wheelbarrow.—Peter Noling, Woodside, Wis.—This invention has for ts object to furnish an improved barrow, which shall be so constructed and arranged that a much greater amount of work may be done in the same time, and with greater ease than when an ordinary barrow is used, and which shall, at the same time, be simple in construction and effective n operation.

Car Coupling.—James A. Morrison, Brady's Bend, Pa.—This invention has for its object to furnish an improved car coupling, strong and simple in construction, effective in operation, conveniently operated, and not liable to break or get out of order.

Hay Tedder.—J. K. Collins, Hartford, Vt.—This invention has for its object to furnish a simple and convenient machine for tedding hay, which shall be so constructed and arranged as to operate the tedding forks with a movement similar to the movement of the fork when the hay is being tedded by hand.

Water Wheel.—V. M. Baker, Preston, Minn.—This invention has for its object to improve the construction of horizontal water wheels so as to make them more efficient in operation, enabling them to utilize a larger proportion of the water, and bring them more fully under the control of the operator.

Process for Manufacturing Wool into all Kinds of Colors and Goods without the Use of Oil or Grease in Carding and Spinning.—J. Saxton and B. Saxton, Sumner, Ill.—This invention has for its object to furnish an improved process, by the use of which wool may be manufactured into yarn and cloth without the use of oil or grease, so that the work may all the time be clean and the cloth ready for market when taken from the loom.

Peat Machine.—John S. Kelly, New York city.—This invention has for its object to furnish a simple, convenient, and effective machine for scraping, condensing, and partially drying peat upon the bed and without removing it therefrom, thereby enabling the peat to be prepared for market at trifling expense.

Velocipede.—McClintock Young, Frederick, Md.—This invention relates to a new manner of constructing the frame, or reach, the steering frame, the saddle, and the brake of a velocipede, for the purpose of producing a light instrument fully as strong and reliable as the heavy machines now in use.

Bridle Bit.—C. M. Huckins, Johnsbury, Vt.—This invention relates o a new bridle bit for horses, which shall be so constructed that it may be used as a straight rigid bit or as a power bit, when driving or riding an unruly or hard-mouthed horse, and which shall be so constructed as to give he rider or driver full control over the horse.

Dentists' Grinding Wheel.—John K. Merrick, Odell, Ill.—This invention relates to improvements in grinding wheels, for dentists' use, for grinding and polishing teeth. It consists in the construction of such wheels of glass, and in a peculiar form calculated to promote the efficiency thereof.

Construction of Cars.—M. C. Lawless, Montana, Iowa.—This invention relates to improvements in the attachment of the timbers of cars which support the drawheads to the permanent stringing, the object of which is to afford a ready means of detaching them for repairs.

Roof Scaffold Bracket.—S. Clough, Monmouth, Maine.—This invention relates to a new and useful improvement in brackets for scaffolds on roofs.

Lubricator.—Carl August Baumgart, Allegheny City, Pa.—This invention relates to a new and useful improvement in lubricators, or "oilers," whereby they are rendered more sure in their operation and more useful than they have hitherto been.

Compound for Roadways, Pavements, etc.—Russell Fisk, New York city.—This invention relates to new and useful improvements in compounds, to be used in connection, by admixture, with sand, gravel, broken stone, cinders, and other like matters, for the construction of sidewalks, pavements, till, brick, and artificial stone.

Water Tweer.—Edward Davidson, Boston, Mass.—This invention relates to improvements in water tweers, designed to provide a simple, cheap, and efficient arrangement; also, an adaptation of the same for connection directly to the water tank, or for detachment and use separated and moved away from it, as is sometimes required by the nature of the work in hand.

Medicated Cigars.—Louis Walther, New York city.—This nvention relates to improvements in cigars, and it consists in imparting an improved flavor to them, and in expelling the nicotine by steeping the tobacco leaves previous to being formed into cigars, in a liquor formed of vegetable substances.

Hay or Cotton Press.—James A. McGillivrae and C. O. Wheeler, Matteson, Ill.—This invention consists of an arrangement in a case, adapted in shape and size for occupying that position on a wagon of an ordinary wagon box, of a sliding plunger operated by racks and pinions, receiving and discharging passages and doors and door fastenings. Also, of adjustable ends and walls for the chamber, in which the finished bale is inclosed.

Raking, Loading, and Elevating Apparatus.—Charles P. Hale, Calhoun, Ky.—This invention relates to improvements in raking, or gathering, loading, and elevating apparatus for hay, straw, sand, and other substances to be gathered from the ground for loading, transporting, and elevating to a stack, building, or other place. It consists in an improved arrangement on a truck of a rake, or gathering instrument, which also delivers the substance gathered into a rack, and a receiving and delivering or elevating rack with connecting and tripping gear for a hoisting apparatus.

Casting Hollow Articles.—J. Brunner, New York city.—This invention consists in forming the hollow castings by the employment of chill molds, made in two parts, with large openings from the exterior to the molds at one side, and smaller air-escaping passages from the opposite sides, which molds are plunged into the molten metal from which the castings are to be made, with the said large openings downward and the smaller ones upward, so that the metal will flow in freely to the molds and become chilled against the surface of the molds and solidified sufficiently to form the exterior shell of the article required. The flask or mold is then raised vertically out of the molten metal to allow the central part not solidified to flow out, leaving the castings hollow. They are then removed from the molds in the usual way.

Vise and Drill.—Otis Dean, Richmond, Va.—This invention relates to improvements in the construction of the vise and drill, recently patented by the inventor, in which improved device the fixed jaw is made use of as the stock of the drill spindle, the movable jaw as the table and support of the articles to be drilled, and the vise serves as the feed screw. The present invention comprises an improved arrangement of the vertical adjusting spindle of the support for the jaws, and the adaptation of the feeding or vise screw for operation, either by the ordinary vise lever or by the crank used for turning the drive spindle; also, certain improvements in the connection of the vise screw and the drill spindle with the fixed jaw.

Machine for Wiring Blind Rods.—John Holzberger, Newark, N. J.—This invention relates to a new machine for forcing wire staples into the rods of window blinds, and also into the slats of the same. The invention consists in the arrangement of double-detaining plates, which serve to separate the several staples as the same slide down on an inclined plate.

Stirrup.—C. R. Van Osdel, Chicago, Ill.—This invention has for its object to construct a stirrup, which will form a support for the whole foot, which can be adjusted for any length of foot, and which will swing around to release the foot in case the rider is thrown.

Horse Hay Fork.—David P. Stewart, Spruce Creek, Pa.—This invention consists in the arrangement, upon a straight pointed stock, to which the elevating rope is attached, of a set of jointed hooks capable of closing with the point of the stock to be forced into the hay, and then opening to hold the hay, and a set of gathering and holding hooks, connected together by slides parallel with the stock and operated simultaneously by setting and tripping levers.

Car Coupling.—A. H. Clark, Otisville, Mich.—The object of this invention is to provide a safe and durable coupling for railroad cars, one which shall couple automatically and be sure in its operation.

Reaping and Mowing Machines.—E. M. Birdsall, Penn Yan, N. Y.—This invention relates to a new and useful improvement in fastening the knives or cutters to the cutter bars of reaping and mowing machines.

Cribs and Cradles.—L. A. Chichester, Poughkeepsie, N. Y.—This invention relates to an improvement in cribs and cradles for children and dolls, whereby they are made cheaper, handsomer, and more durable, than when made in the ordinary manner.

Friction Matches.—W. H. Rogers, New York city.—This invention relates to a new and useful improvement in friction matches, and it consists in coating the match below the igniting end with an inflammable composition.

Hoisting Apparatus.—W. M. Howland and G. L. Howland, Topsham, Me.—This invention relates to improvements in apparatus for hoisting heavy weights, pulling stumps, and the like, by hand power, and consists in the application to one of the legs of a tripod, which is detachably connected, to the other two by a hook, having a double shank which is separated for attachment to the said leg, so as to provide a space between the end of the leg and the hook for the same, of a pair of ratchet wheels on a chain, winding shaft, a pair of pawls, connecting rods, operating lever, and a device for throwing the pawls out of action with the catch wheels, under an arrangement whereby the stones or other weights may be raised or lowered, by the distance of one or more notches of the ratchet wheels at each movement of the lever.

Combined Table and Cradle.—E. A. Goodes, Philadelphia, Pa.—This invention consists of a circular or other formed table top, the under half of one side of which is detachable, a set of semi-elliptical legs, and a circular brace connected to the legs at the center, made in two parts and brought together, all so arranged as to be readily adjusted to the conditions of either a table or cradle.

Fastening Bolt nuts.—W. C. Mason, Beaver Falls, Pa.—The object of this invention is to provide means of preventing the turning off of saw nuts from their bolts.

Compensating or Equilibrium Spring.—Charles Shea, Newark, N. J.—The object of this invention is to provide means for avoiding the jar and inconvenience on carriages and railroad cars, and for economizing springs on the same. The invention consists chiefly in providing compensating springs in connection with the ordinary springs of carriages, cars, locomotives, etc., the said compensating springs being so arranged that they act in an opposite direction to the main springs.

Draft Bars for Vehicles.—J. B. Brewster, Flushing, N. Y.—The object of this invention is to so strengthen the draft bars, that is to say, the whiffletrees, evener bars, pole yokes, poles, and shafts, of all wheeled vehicles and sleighs, that the same will be greatly strengthened in the direction in which the greatest strain is applied.

Machine for Making Cop Tubes.—Henry and James Douglas, Glasgow, Scotland.—This invention relates to new and useful improvements in machinery for making cop tubes, whereby it is designed to provide more efficient machines than those now in use. The invention consists in a new and improved arrangement of forming rollers, a forming mandrel, and a finishing brush.

Baking and Drying Stove.—F. S. Reefy and S. M. Zent, Roanoke, Ind.—This invention relates to improvements in baking and drying stoves, whereby it is designed to provide an attachment to a cast iron stove which may be used for drying fruit or baking, with great facility, and which will utilize the heat as much as possible.

Answers to Correspondents.

CORRESPONDENTS who expect to receive answers to their letters must, in all cases, sign their names. We have a right to know those who seek information from us; beside, as sometimes happens, we may prefer to address correspondents by mail.

SPECIAL NOTE.—This column is designed for the general interest and instruction of our readers, not for gratuitous replies to questions of a purely business or personal nature. We will publish such inquiries, however, when paid for as advertisemets at $1·00 a line, under the head of "Business and Personal."

☞ *All reference to back numbers should be by volume and page.*

P. M. M., of N. Y., writes for an explanation of a singular case of collapse occurring in a low-wines still. The cause of this collapse must have been the removal of internal pressure by condensation, the external pressure of the atmosphere then acting to crush in the crown of the still. How this could have occurred with the worm open and the stream of high wines passing through being only a small fraction of its capacity, while the ordinary operation of distillation was in progress, seems unaccountable. It is probable some condition has been overlooked by our correspondent.

S. R. of Vt.—We have often used both a rotating slide valve and oscillating cylindrical valve in hydraulic machines, and either will work well for a time. The cylindrical valve is however better replaced by a tapering one like those used in ordinary water cocks, as that will enable you to take up all wear on the valve and seat. This wear soon makes a cylindrical valve leak where much work is required. The rotating slide valve, however, will keep tight a long while with fair treatment.

D. V., of Va.—A machine is only a means of transmitting and applying force to work. It of itself does nothing. When moved by the application of force, it does not even transmit the whole of that force but absorbs a portion of it. How, then, can you by placing a machine between force and work, expect to apply more force to work with, than without the intervening machine. A second look at your computation will show you your error.

C. E., of Mich.—What is called puddled steel is made by stopping the process of puddling iron at the precise time when sufficient carbon remains in it to form steel. When the puddling is carried beyond this point, more of the carbon is combined with oxygen, and passing off in the form of carbonic acid, leaves the reduced metal in a state called malleable iron, the principal difference between which and steel is the less amount of carbon it contains.

D. M. T., of N. Y.—Two bodies moving in contact with each other, and at a common velocity, can neither of them take motion from the other. There are, however, some very nice points connected with this subject which we cannot discuss here; but you may safely conclude that when one body is imparting motion to another body, the latter must be moving with less velocity in some direction than the former.

D. K. M., of Pa.—You can prevent in a great degree the rusting of an iron vessel in which water is boiled by greasing the interior and allowing it to, as the housekeepers say, "burn on." Wipe it out with a greasy rag and then let it heat till it smokes freely. Repeat this several times and you will not be troubled again soon.

R. M., of Ill.—To compute the length of an arc of any number of degrees, radius being given, multiply the radius by 710 divided by 113. Multiply this product by the number of degrees in the arc, and divide by 360, and you will have the length of the arc in the denomination by which the length of the radius is expressed.

L. T. D., of Md.—Where a force pump is employed to force water to a great hight, it is the best practice, in our opinion, to use more than one check valve, as the valves only add to the power required to work the pump by their weight, while the wear will be distributed provided the valves are properly adjusted.

M. M. G., of N. Y.—You can coat malleable iron castings permanently with copper by the use of the electro-plating process, which you will find fully described in the "Practical Metal Workers' Assistant," published by Henry Carey Baird, of Philadelphia. That work also gives the other information you desire.

C. J. H., of Pa.—To kill knots before painting apply a paste of wet lime to them. When the paste dries apply a hot iron to the knot which will melt out the pitch, and the lime will absorb it. The spots may be rubbed down smooth and then paint applied.

L. C. D., of Wis.—The details of the art of encaustic painting, as practiced by the ancients, are not now known. According to Pliny, it is probable that the vehicle of the colors was melted wax, but attempts at imitating this method in modern times have been unsuccessful.

D. S., of N. J.—Glue is not soluble in oil, as you might easily have determined by an experiment. It may therefore be used to coat over the insides of oil casks, and will in great measure prevent loss from leakage.

C. B. H., of N. Y.—Agates, carnelians, and other hard stones, are sawed with small metal plates armed with diamond dust. You can get such work done by Michael Fox & Co., No. 1 Maiden Lane, New York.

E. C. H., of R. I.—Your device is as old as Vitruvius, who describes it exactly. Bell-shaped reflectors of sound were used in the Corinthian theaters, and were introduced into Rome after the taking of Corinth.

T. P., of N. C.—The aluminum bronze is the strongest alloy yet discovered. Its composition is ninety parts of copper to ten of aluminum.

C. L. M., of Ca.—What have been called Egyptian pebbles are a species of agate or jasper.

G. W. B., of Wis.—The stone you send appears to be agate.

APPLICATIONS FOR EXTENSION OF PATENTS.

Shirt Collars.—Polly Hunt and George W. Hunt, of New York city, administrator of the estate of Walter Hunt, deceased, has petitioned for an extension of the above patent. Day of hearing, December 13, 1869.

Horse Hay Rake.—Mary G. Pratt, administratrix de bonis non, of the estate of Randal Pratt, late of the township of Marple, Pa., has petitioned for the extension of the above patent. Day of hearing, December 20, 1869.

Gas Cooking Stove.—Hiram B. Musgrove, Cincinnati, Ohio, has petitioned for an extension of the above patent. Day of hearing, December 20 1869.

Plow.—Benjamin F. Avery, of Louisville, Ky., has petitioned for the extension of the above patent. Day of hearing, December 20, 1869.

Business and Personal.

The Charge for Insertion under this head is One Dollar a Line. If the Notices exceed Four Lines, One Dollar and a Half per line will be charged.

Send for Agents' Circular—Hinkley Knitting Machine Co., 176 Broadway.

To Inventors—Garrison's Model and Exchange Rooms for exhibition of models and sale of rights for the Northwest, No. 5 Arcade Court, Chicago. The largest establishment of the kind west of New York.

Territory for sale or exchange for real estate of the O U C I X L carriage-seat fastener. Send for circular. Address H. E. Murray, Chester, Orange county, N. Y.

E. Myers, Creagerstown, Md., wants address of harvester makers.

Engine builders, planing and machinery for a sash, blind, and door factory, send price lists to P. O. Lock Box No. 3, Lavaca, Texas.

American Oil Feeders are in use on shafting and loose pulleys at American Institute Fair. Made by J. B. Wickersham, 143 South Front st., Philadelphia. Send for circular.

The Novelty Job Printing Presses, for printers, merchants, and amateurs. C. C. Thurston, Agent, Brooklyn, N. Y.

Manganese Ores suitable for glass, steel, oil boilers, at low prices. Muriatic Acid, full strength, price 1¾ cents per lb. Soda Ash. Bleaching Powder, fresh made, full test, at market prices. Michigan Chemical Company, Jackson, Mich.

Wanted—A large quantity of cast-steel castings, manufactured ough and strong, weight half-pound each. Address H. Birdsall, Son & Co., Penn Yan, N. Y.

Shafting, Hangers, and Pulleys, Craig's Oscillating Steam Ennes, on hand and to order. Gallatin & Brevoort Machine Works, 223 Front st., New York.

Peck's patent drop press. Milo Peck & Co., New Haven, Ct.

The Best and Cheapest Boiler-flue Cleaner is Morse's. Send to A. H. & M. Morse, Franklin, Mass., for circular. Agents wanted.

Snow-plow patent for sale. M. A. & I. M. Cravath, Lansing, Mich.

For Norris' Self-acting Spooling Gage (measures spool silk and cotton thread), address R. H. Norris, Paterson, N. J.

Wanted—Manufacturer to introduce and fill orders for a patent cast-iron shutter worker. Address T. H. Bradley, War Department, Washington, D. C.

Every wheelright and blacksmith should have one of Dinsmore's tire shrinkers. Price $40. R. H. Allen & Co., P.O. Box 376, New York.

Glynn's Anti-Incrustator for Steam Boiler—The only reliable preventative. No foaming, and does not attack metals of boiler. Liberal terms to Agents. C. D. Fredricks, 587 Broadway, New York.

Chemicals, Drugs, Minerals, Metals, Acids, etc., for all Mechanics and Manufacturers, for sale by L. & J. W. Feuchtwanger, Chemists, and Importers of Drugs and Minerals, 55 Cedar st., New York.

Clothes Wringers of all kinds repaired or taken in part pay for the "Universal," which is warranted durable. R. C. Browning, Agent, 32 Courtlandt st., New York.

For Sale—Cotton Planter.—The entire right of the King Cotton Planter—the only successful in use. Have been worked since the war, and given universal satisfaction. The machine is simple, strong, and can be built cheaply. Will sell at a low figure. Reason for disposing of it is want of time to give it proper attention. Address S. N. Brown & Co., Dayton, O.

Hot Pressed Wrought Iron Nuts, of all sizes, manufactured and for sale at moderate prices by J. H. Sternbergh, Reading, Pa.

Cold Rolled—Shafting, piston rods, pump rods, Collins pat. double compression couplings, manufactured by Jones & Laughlins, Pittsburgh, Pa.

Man'f'rs of grain-cleaning machinery and others can have sheet zinc perforated at 2c. per sq. ft. R. Aitchison & Co., 845 State st., Chicago.

Send for a circular on the uses of Soluble Glass, or Silicates of Soda and Potash, fire and water-proof. Manufactured by L. & J. W. Feuchtwanger, Chemists and Drug Importers, 55 Cedar st., New York.

Mill-stone dressing diamond machine, simple, effective, durable. Also, Glazier's diamonds. John Dickinson, 64 Nassau st., New York.

Leschot's Patent Diamond-pointed Steam Drills save, on the average, fifty per cent of the cost of rock drilling. Manufactured only by Severance & Holt, 16 Wall st., New York.

For solid wrought-iron beams, etc., see advertisement. Address Union Iron Mills, Pittsburgh, Pa., for lithograph, etc.

Machinists, boiler makers, tinners, and workers of sheet metals read advertisement of the Parker Power Presses.

Diamond carbon, formed into wedge or other shapes for pointing and edging tools or cutters for drilling and working stone, etc. Send stamp for circular. John Dickinson, 64 Nassau st., New York.

Official List of Patents.

Issued by the United States Patent Office.

FOR THE WEEK ENDING OCT. 12, 1869.

Reported Officially for the Scientific American

SCHEDULE OF PATENT OFFICE FEES:

On each caveat	$10
On filing each application for a Patent (seventeen years)	$15
On issuing each original Patent	$20
On appeal to Commissioner of Patents	$20
On application for Reissue	$30
On application for Extension of Patent	$50
On granting the Extension	$50
On filing a Disclaimer	$10
On an application for Design (three and a half years)	$10
On an application for Design (seven years)	$15
On an application for Design (fourteen years)	$30

In addition to which there are some small revenue-stamp taxes. Residents of Canada and Nova Scotia pay $500 on application.

For copy of Claim of any Patent issued within 30 years $1

A sketch from the model or drawing, relating to such portion of a machine as the Claim covers, from $1
upward, but usually at the price above-named.

The full Specification of any patent issued since Nov. 20, 1866, at which time the Patent Office commenced printing them ..... $1·25

Official Copies of Drawings of any patent issued since 1836, we can supply at a reasonable cost, the price depending upon the amount of labor involved and the number of views.

Full information, as to price of drawings, in each case, may be had by addressing

MUNN & CO.,
Patent Solicitors, No. 37 Park Row, New York.

95,627.—BORING TOOL.—Alexander Allan, New York city.
95,628.—PNEUMATIC APPARATUS FOR DRAWING ALE.—Henry Andes, Wilkesbarre, Pa.
95,629.—VELOCIPEDE.—Solomon Andrews, Perth Amboy, N. J.
95,630.—WATER WHEEL.—V. M. Baker, Preston, Minn.
95,631.—HAY AND COTTON PRESS.—W. C. Banks, Como Depot, Miss.
95,633.—BATH TUB.—Arad Barrows, Philadelphia, Pa
95,632.—REEL—J. H. Barker, Washington, D. C.
95,634.—ROOFING FABRIC.—D. P. Bartlett and Alfred Adams, Chagrin Falls, Ohio.
95,635.—LUBRICATOR.—C. A. Baumgart, Allegheny City, Pa.
95,636.—BASE BURNING STOVE.—Robert Batting, Albany, N.Y.
95,637.—STEAM ENGINE.—William Baxter (assignor to W. D. Russell), Newark, N. J.
95,638.—HARVESTER-CUTTER.—E. M. Birdsall, Penn Yan, N.Y.
95,639.—GRINDSTONE FRAME.—Byron Bisbee, North Waterford, Me.
95,640.—ORE CONCENTRATOR AND AMALGAMATOR.—J. S. Bradford, New York city.
95,641.—DRAFT BAR FOR VEHICLES.—J. B. Brewster, Flushing, N. Y.
95,642.—SUPPORTING BARS FOR VEHICLES.—J. B. Brewster, Flushing, N. Y.
95,643.—RAILWAY RAIL CHAIR.—James Bridger, Newark, N. Y.
95,644.—HEAT RADIATOR.—Warren Brown, Sandusky, Ohio.
95,645.—CASTING HOLLOW ARTICLES.—J. Brunner, New York city.
95,646.—BLANK FOR AX POLLS.—William Bunton (assignor to himself and G. W. Jope), Pittsburgh, Pa.
95,647.—HAY TEDDER.—H. M. Burdick, Ilion, N. Y. Antedated May 19, 1869.
95,648.—VELOCIPEDE.—V. H. Buschman, Baltimore, Md. Antedated Sept. 29, 1869.
95,649.—STOVE PIPE THIMBLE.—C. A. Buttles, Milwaukee, Wis.
95,650.—MACHINE FOR BENDING SHEET METAL FOR CORNICES, ETC.—C. A. Buttles and Dennis Murphy, Milwaukee, Wis.
95,651.—COTTON CHOPPER AND SCRAPER.—H. B. Cage, Madison Station, Miss.
95,652.—CAR COUPLING.—A. H. Clark, Otisville, Mich.
95,653.—STEAM ENGINE.—W. H. T. Clark, San Francisco, Cal.
95,654.—ROOF BRACKET.—S. Clough, Monmouth, Me.
95,655.—CALENDAR.—G. L. Coburn, Hartford, Conn.
95,656.—HAY TEDDER.—J. K. Collins, Hartford, Vt.
95,657.—FRUIT HOUSE.—Nathan Cope, New Waterford, Ohio.
95,658.—EXCAVATOR.—James Cowden, La Prairie Centre, and Daniel Brown, Akron, Ill.
95,659.—HEMP BREAK.—E. M. Crandal, Alton, Ill.
95,660.—FIRE PLACE.—J. M. Crockett, Newbern, Va.
95,661.—WATER TWEER.—Edward Davidson, Boston, Mass.
95,662.—STEAM CHEESE-VAT.—J. A. Davis, Watertown, N. Y.
95,663.—VISE.—Otis Dean, Richmond, Va.
95,664.—COOKING STOVE.—J. De Frain (assignor to himself and William Callahan), Philadelphia, Pa.
95,665.—MANUFACTURE AND APPLICATION OF GAS FROM PETROLEUM, ETC.—T. S. Dickerson, assignor for one half his right to R. M. Whipple, Chicago, Ill.
95,666.—APPARATUS FOR EXHIBITING PHOTOGRAPHS.—Martial Dimock, Newark, N. J., assignor to S. S. Barnaby and David Millard.
95,667.—LAMP CHIMNEY.—Edward Dithridge, Pittsburgh, Pa.
95,668.—EVAPORATING SALT WATER, ETC.—W. J. Dodge, Syracuse, N. Y.
95,669.—COMBINED SEED-SOWER AND CULTIVATOR.—J. W. Doud, Ward's Corners, Iowa.
95,670.—MACHINE FOR MAKING COP-TUBES.—Henry Douglas and James Douglas, Glasgow, Scotland.
95,671.—OVEN.—J. S. Dunham and James Green, St. Louis, Mo.
95,672.—STONE DRILL.—W. C. Edenfield, Savannah, Mo. Antedated Sept. 27, 1869.
95,673.—COMPOUND FOR PAVEMENTS, ROADWAYS, ETC.—Russell Fisk, New York city.
95,674.—GRAIN SEPARATOR.—F. R. Foster, Brandon, Wis.
95,675.—HORSE CANT-HOOK.—E. W. Gale (assignor to himself and J. G. Gale), Monroeton, Pa.
95,676.—CLOD FENDER.—F. M. Gardner, Brown township, Ohio.
95,677.—RAILWAY CAR BRAKE SHOE.—S. B. Gardner, Freeport, Ill., assignor to himself and A. H. Leedy.
95,678.—COAL ASH SIFTER.—J. L. Griffin, Redding, Conn.
95,679.—SOAP.—H. L. Guldin, Robeson township, Pa.
95,680.—HAY LOADER.—C. P. Hall, Calhoun, Ky.
95,681.—CORN PLANTER.—J. J. Harpel, Lebanon, Pa.
95,682.—KEY GUARD.—B. R. Hathaway, Mormon Island, Cal.
95,683.—HAND CORN PLANTER.—E. W. Haven, Brandon, Vt.
95,684.—SKIRT.—Henry Hayward, New York city.
95,685.—BASE BURNING STOVE.—J. C. Henderson, Troy, N. Y.
95,686.—APPARATUS FOR HEATING PUDDLING FURNACES.—Samuel A. Hill and Charles F. Thumm, Oil City, assignors to themselves and Oliver P. Scaife, Pittsburgh, Pa.
95,687.—DEVICE FOR GENERATING STEAM IN STEAM GENERATORS.—Samuel A. Hill and Charles F. Thumm, Oil City, assignors to themselves and Oliver P. Scaife, Pittsburgh, Pa.
95,688.—APPARATUS FOR GENERATING STEAM IN BOILERS.—Samuel A. Hill and Charles F. Thumm, Oil City, assignors to themselves and Oliver P. Scaife, Pittsburgh, Pa.
95,689.—MACHINE FOR TARRING PAPER FOR ROOFING.—James Howard, West Manchester, Pa.
95,690.—ROAD SCRAPER.—Lymon Howe, Worcester, assignor to himself, Jonathan Luther, same place, and Moses W. Wheeler, Milbury, Mass.
95,691.—HOISTING APPARATUS.—Wm. M. Howland and Geo. L. Howland, Topsham, Me.
95,692.—STATION INDICATOR.—George R. Johnson, Wilmington, Del.
95,963.—DROP HAMMER.—Edward Kaylor, Pittsburgh, Pa.
95,964.—LATHE.—James Kievlan (assignor to himself and Wm. Wisdom), Chicago, Ill.
95,695.—LINIMENT AND MEDICAL COMPOUND.—John King, Warren county, Ohio.
95,696.—FIREPROOF PAINT.—Emil Kunzendorf, New York city.
95,697.—RAILWAY CAR.—M. C. Lawless, Montana, Iowa.
95,698.—ANCHOR.—Geo. A. Lloyd and Chas. A. Stewart, San Francisco, Cal.
95,699.—RAILWAY BRAKE.—Wm. W. Loomis, Wilkesbarre, Pa.
95,700.—MACHINE FOR WIRING HINGES.—Ellis Luther, West Troy, N. Y.
95,701.—VEHICLE PROPELLED BY HAND.—Peter Lutteke, St. Louis, Mo.
95,702.—CHIMNEY.—Benj. F. Mann, Oakland, Cal.
95,703.—APPARATUS FOR IMPARTING AGE TO WHISKY AND OTHER SPIRITS.—Wm. P. Martin, Millersburg, Ky.
95,704.—LOCK NUT.—Wm. C. Mason (assignor to himself and J. H. Nichols), Beaver Falls, Pa.
95,705.—RAILWAY-CAR AXLE BOX.—Mark McCammon, Chicago, Ill.
95,706.—COMBINED PIPE TONGS AND WRENCH.—V. K. McElheny, Pittsburgh, Pa., assignor to himself, Ernest Frank, and John B. Adt.
95,707.—HAY AND COTTON PRESS.—James A. McGillivrae and C. O. Wheeler (assignors to C. O. Wheeler), Matteson, Ill.
95,708.—LACING EYE.—Albert G. Mead (assignor to himself, Charles J. Addy, and George H. Wood, assignors to Albert G. Mead, Charles J. Addy, and Milton A. Kent), Boston, Mass. Antedated September 27, 1869.
95,709.—MODE OF PREPARING ORNAMENTAL TRANSPARENT LETTERS FOR SIGNS, ETC.—Emil F. Meyer, Brooklyn, N. Y. Antedated October 5, 1869.
95,710.—COFFEEPOT.—Elie Moneuse and Louis Duparquet, New York city.
95,711.—RAILWAY CAR COUPLING.—James A. Morrison, Brady's Bend, Pa.
95,712.—WAGON BOX.—Wm. F. Moore and Jacob A. Bowers, Channahon, Ill.
95,713.—NECKTIE RETAINER.—Porter C. Moulton, New Haven, Conn.
95,714.—GRAIN BINDER.—J. H. Mudgett, Camanche, Iowa.
95,715.—PRESERVING MEAT FOR PASTRY PURPOSES.—George H. Monroe, New York city.
95,716.—MODE OF LUBRICATING JOURNALS.—Samuel Nash (assignor to himself and John M. Duncan), Boston, Mass.
95,717.—WHEELBARROW.—Peter Noling, Woodside, Wis.
95,718.—COMBINED WHEELBARROW AND GARDEN PLOW.—John D. O'Callahan, Calhoun, Ga.
95,719.—MILK COOLER AND DEODORIZER.—Alexander Osborn, Eagleville, Ohio.
95,720.—GAS CHECK FOR ORDNANCE.—J. W. Pearson, Watertown, assignor to Alfred B. Ely, Newton, Mass.
95,721.—MACHINE FOR MAKING SHEET-METAL PANS.—Geo. S. Peck (assignor to himself and Wm. H. Morgan), Towanda, Pa.
95,722.—MILK COOLER.—Julius R. Pond, New Hartford, Conn.
95,723.—MILK HOUSE.—Julius R. Pond, New Hartford, Conn.
95,724.—HYDRANT STOPCOCK ROD.—Henry Rausch, Brooklyn N. Y.
95,725.—BAKING AND DRYING STOVE.—F. S. Reefy and S. M. Zent, Roanoke, Ind.
95,726.—REVERSIBLE AXLE FOR CARRIAGES.—J. R. Renkin (assignor to himself and M. M. Grumbling), Hillsdale, Pa.
95,727.—FIREBOX FOR STEAM GENERATORS.—Edwin L. Robbins, Owego, N. Y.
95,728.—FOOT OR BED WARMER.—L. M. Roby, Leesville, Ohio.
95,729.—MACHINE FOR MILLING THE KNIFE-EDGES OF SCALE BEAMS.—Thomas J. Rockwood, St. Johnsbury, Vt.
95,730.—FRICTION MATCH.—Wm. H. Rogers, New York city.
95,731.—SCREW PROPELLER.—S. W. Rowell, Rutland, Vt.
95,732.—METALLIC ROOFING.—Franklyn Roys, East Berlin, Conn.
95,733.—PROCESS OF PREPARING WOOL FOR MANUFACTURE.—J. Saxton and B. Saxton, Sumner, Ill.
95,734.—HOT-AIR FURNACE.—Ph. I. Schopp, Louisville, Ky.
95,735.—BOILER FOR HYDRATING THE ATMOSPHERE OF APARTMENTS.—Ph. I. Schopp, Louisville, Ky.
95,736.—COMPENSATING OR EQUILIBRIUM SPRING.—Charles Shea, Newark, N. J.
95,737.—WINDOW BLIND.—S. M. Sherman, Fort Dodge, Iowa.
95,738.—HARVESTER.—Amos Smith, Springfield, Ohio. Antedated April 12, 1869.
95,739.—PERMUTATION LOCK.—Daniel Snell, Little Falls, N. Y.
95,740.—DISTILLING APPARATUS FOR SPIRITS.—Frank Sonier, Springfield, Ill.
95,741.—MACHINE FOR MIXING SOAP, PAINT, PASTE, AND OTHER SIMILAR MATERIALS.—John Stainthorp, New York city.
95,742.—PLATE.—Newell D. Stevens (assignor to himself and O. A. Hill), Westbrook, Me.
95,743.—HORSE HAY FORK.—David P. Stewart, Spruce Creek, Pa.
95,744.—WRENCH.—Daniel C. Stillson, Charlestown, Mass.
95,745.—FORMING HORSESHOE CALKS.—Samuel Stone, North Manchester, Conn.
95,746.—METALLIC BAR.—Samuel Stone, North Manchester, Conn.
95,747.—RAILROAD GRAIN TRANSFERRER.—James W. Sykes, Chicago, Ill.
95,748.—SHAFT TUG.—Samuel Taylor, Georgetown, N. J.
95,749.—CENTRIFUGAL PUMP.—Stephen P. Thayer, Baldwinsville, N. Y.
95,750.—OVEN.—J. R. Treadwell, Brooklyn, N. Y.
95,751.—MACHINE FOR GRINDING HARVESTER CUTTERS.—John Weichhart, San Francisco, Cal.
95,752.—MANUFACTURE OF CRYSTAL GLASS.—Otto Wuth, Pittsburgh, Pa.
95,753.—VELOCIPEDE.—McClintock Young, Frederick, Md.
95,754.—SCULLING OAR.—F. T. Angers, Canastota, N. Y.
95,755.—FISHHOOK.—F. T. Angers, Canastota, N. Y.
95,756.—HEATING APPARATUS.—John Armstrong, Jr., San Francisco, Cal.
95,757.—MEANS FOR PREVENTING BACKLASH IN MACHINES DRIVEN BY GEARING.—G. H. Babcock, J. P. Manton, and Jonathan Boyd, Providence, R. I. Patented in England May 8, 1868.
95,758.—MACHINE FOR PRINTING PAPER, CLOTH, ETC.—G. S. Barton, Worcester, Mass.
95,759.—DRAFTSMEN'S SQUARE AND TRIANGLE.—A. V. Benoit, New York city.
95,760.—GRAINING MACHINE.—William H. Berger, Pittsburgh, Pa.
95,761.—CARRIAGE CLIP.—Alfred Bixby, Lansing, Mich.
95,762.—CULTIVATOR.—Jeremiah Bohan, New Hartford, Iowa.
95,763.—REVOLVING PROW FOR VESSELS.—David Bookwalter, Gardner, Ill.
95,764.—FAN.—Otto Bruck, New York city.
95,765.—REVOLVING BILLIARD TABLE.—Solomon Brunswick, St. Louis, Mo.
95,766.—PAPER FILE.—Hubert Burgess, San Francisco, Cal.
95,767.—STOP MOTION FOR DRAWING FRAME.—J. S. Casey, Voluntown, Conn.
95,768.—CRIB OR CRADLE.—L. A. Chichester, Poughkeepsie N. Y.
95,769.—MOWING MACHINE.—T. J. Clark and G. M. Clark, Higganum, Conn.
95,770.—MILKING STOOL.—S. P. Clemons, Dansville, N. Y.
95,771.—MEDICINE FOR RHEUMATISM.—Geo. Conroy (assignor to R. A. Smith), Mendocino co., Cal.
95,772.—WOOD VISE.—R. F. Cook and J. F. Post, Potsdam, N. Y.; said Cook assignor to said Post.
95,773.—WEATHER STRIP.—A. M. Corbit, Bethlehem, Iowa.
95,774.—STAVE JOINTER.—H. A. Crossley, Cleveland, Ohio.
95,775.—CARPET.—Thos. Crossley, Bridgeport, Conn.
95,776.—FELTED CARPET FABRIC.—Thomas Crossley, Bridgeport, Conn.
95,777.—MACHINE FOR PRINTING CARPETS.—Thos. Crossley, Bridgeport, Conn.
95,778.—GRINDING CURRIERS' KNIVES.—Henry Cunningham, Albany, N. Y.
95,779.—MODE OF SOFTENING LEATHER.—Henry Cunningham, Albany, N. Y.
95,780.—MACHINE FOR SPLITTING LEATHER.—Henry Cunningham, Albany, N. Y.
95,781.—MILK PAIL AND STRAINER.—D. S. Curtiss, Washington, D. C.
95,782.—PLANING MACHINE.—Frank Douglas, Norwich Town, Conn.
95,783.—COAL-ASH SIFTER AND TABLE.—P. J. Dwyer, Elizabeth Port, N. J.
95,784.—ARCHED BRIDGE.—J. B. Eads and Henry Flad, St. Louis, Mo.
95,785.—WATER LOCOMOTIVE.—G. A. Fall, Hoboken, N. J.
95,786.—PILE DRIVER.—Henry Flad (assignor to J. B. Eads), St. Louis, Mo.
95,787.—RAILWAY TRACK CLEARER.—Geo. Fowler, Claverack, N. Y.
95,788.—ROTARY HARROW.—H. A. Gaston, Stockton, Cal.
95,789.—COMBINED SEEDER AND GRAIN DRILL.—H. A. Gaston, Stockton, Cal.
95,790.—SULKY CULTIVATOR.—Oscar L. Gaylord, Plainfield, Ill.
95,791.—TABLE AND CRADLE COMBINED.—E. A. Goodes (assignor to the Philadelphia Patent and Novelty Company), Philadelphia, Pa.
95,792.—WASHBOARD.—Benjamin F. Gott, Brooklyn, E. D., N. Y.
95,793.—COMBINED TOOL.—Emile Granier, Paris, France.—Patented in France, May 9, 1868.
95,794.—SPARK ARRESTER.—Isaac H. Graves, Sacramento City, Cal.
95,795.—CAST METAL CHIMNEY CAP.—Wm. Green, Snyder township, Pa.
95,796.—ELECTRICAL FIRE-ALARM THERMOMETER.—J. H. Guest, Brooklyn, N. Y.
95,797.—POCKETBOOK.—Frederick Heiles, New York city.
95,798.—APPARATUS FOR DRYING SUGAR.—Alexander Herbst Moscow, Russia.
95,799.—DOOR SILL.—D. Hitchcock and D. S. Trout, Arcola Ill.
95,800.—MACHINE FOR WIRING BRIND RODS.—John Holzberger, Newark, N. J.
95,801.—BRIDLE BIT.—C. M. Huckins, East Topsham, Vt.
95,802.—NAIL-CUTTING MACHINE.—C. D. Hunt, Fairhaven, Mass.
95,803.—AUGER.—W. A. Ives, New Haven, Conn.
95,804.—FILE-CUTTING MACHINE.—James Jervis, Baltimore, Md.
95,805.—SHOE.—A. S. Kelly, Haverhill, Mass.
95,806.—PEAT MACHINE.—J. S. Kelly, New York city

95,807.—Mowing Machine. — William G. Kenyon, Wakefield, R. I.
95,808.—Hinge for Carriage Tops.—Henry Killam, New Haven, Conn.
95,809.—Cutter Head.—Jefferson Kindleberger and William Augustus Arnold (assignors to "The Inventors' Association,") San Francisco, Cal.
95,810.—Machine for Tenoning Blind Slats.—Jefferson Kindelberger and W. A. Arnold (assignors to "The Inventors' Association,") San Francisco, Cal.
95,811.—Bakers' Oven.—J. G. Kluge, New York city.
95,812.—Grate Bar.—L. F. Lakey and W. B. Hayte, Quincy, Ill.
95,813.—Hanger.—P. P. Lane and Edward Myers (assignors to Lane & Bodley), Cincinnati, Ohio.
95,814.—Suspended.
95,815.—Scaffold Bracket.—Noah Lovell (assignor to himself and E. W. Mixer), Adrian, Mich.
95,816.—Lock for Mail Bags.—R. O. Lowrey, Salem, N. Y.
95,817.—Mail Bag.—R. O. Lowrey, Salem, N. Y.
95,818.—Mail Bag Fastener.—R. O. Lowrey, Salem, N. Y.
95,819.—Fruit Jar.—W. W. Lyman, Meriden, Conn.
95,820.—Fence.—John Markley, Bucyrus, Ohio.
95,821.—Gate for Draw Bridges.—G. A. May, Chicago, Ill.
95,822.—Toy Hoop.—H. J. May, Brooklyn, N. Y., assignor to himself and J. S. Thornton, Jersey City, N. J.
95,823.—Dentists' Grinding and Polishing Wheel.—J. K. Merrick, Odell, Ill.
95,824.—Composition for Emery Wheels and other Abrading Implements.—E. C. Merrill and A. W. Willard, Charlestown, Vt., assignors to E. C. Merrill.
95,825.—Washing Machine.—J. S. Moore, Jr., and Chas. H. Reynolds, Brooklyn, E. D., N. Y.
95,826.—Horse Power.—G. W. Moyers, Gordonsville, Va.
95,827.—Machine for Polishing and Cleaning Coffee.—Wm. Newell, Philadelphia, Pa.
95,828.—Carriage-Body Brace.—J. H. Ormsby, Dixon, Ill.
95,829.—Feed for Grinding Mills.—Geo. Parker, Poughkeepsie, N. Y.
95,830.—Sausage Stuffer.—Thomas Parker, Shelby, Ohio.
95,831.—Cultivator.—J. C. Pearl, Mendota, Ill.
95,832.—Coach Door.—James Penfield and D. F. Woolsey, Bridgeport, Conn.
95,833.—Machine for Surfacing and Ornamenting Wood.—T. T. Ponsonby (assignor to John Anderson), Liverpool, Eng. Patented in England Sept. 5, 1865.
95,834.—Combined Pliers and Scissors.—John H. Price, Boston, Mass.
95,835.—Railway Car Coupling.—W. V. Pulliam, Kansas, City, Mo.
95,836.—Stone-Crushing Machine.—G. W. Rawson, Cambridgeport, assignor to himself and Michael Hittinger, Somerville, Mass.
95,837.—Hoisting Apparatus.—W. B. Reaney, Chester, Pa.
95,838.—Cut-Off Gear for Steam Engines.—J. B. Root, New York city. Antedated Oct. 2, 1869.
95,839.—Fishing Reel.—J. J. Ross (assignor to Sarah Ross), Buffalo, N. Y.
95,840.—Device for Extinguishing Fires.—Enno Sander, St. Louis, Mo.
95,841.—Circulating Grate for Steam Generators.—James Braden, Indianapolis, Ind., administrator of the estate of James Scanlan, deceased.
95,842.—Spool and Thread Protector.—T. O. L. Schrader, New York city.
95,843.—Manufacture of Iron and Steel.—Charles W. Siemens, Westminster, England. Patented in England, September 20, 1866.
95,844.—House Connection for Sewer, Water, and Gas Pipes.—John Silsby, New York city.
95,845.—Hoop-Bending Machine.—G. E. Smith, Middleport, N. Y.
95,846.—Combined Bit and Tap.—S. A. Smith, New Haven, assignor to The Centre Brook Manufacturing Company, Centre Brook, Conn.
95,847.—Device for Securing Buttons to Fabrics.—D. McLean Somers, Brooklyn, N. Y.
95,848.—Bed and Cushion Spring.—D. E. Somes, Washington, D. C.
95,849.—Apparatus for Utilizing Heat.—B. F. Sturtevant, Jamaica Plains, Mass.
95,850.—Die for Manufacturing Lead Pipe.—B. Tatham, New York city.
95,851.—Carriage Body Brace.—Jacob Taylor, Beloit, Ohio.
95,852.—Horse Rake.—James Thompson, Bridgeport, Ill.
95,853.—Type-Setting Machine. — Joseph Thorne, New York city.
95,854.—Cotton-Bale Fastening. — Matthew Tildesley, Willenhall, England.
95,855.—Hames Fastener.—A. J. Tompkins and J. M. Wegand, Clarksville, Iowa.
95,856.—Folding Chair.—E. W. Vaill, Worcester, Mass.
95,857.—Stirrup.—C. R. Van Osdel, Chicago, Ill.
95,858.—Medicated Cigar.—Louis Walther, New York city.
95,859.—Slate Pencil Holder.—Edward G. Ward, Hoboken, N. J.
95,860.—Stone Channeling Machine.—G. J. Wardwell, Rutland, Vt., assignor to Steam Stone-Cutter Co., New York city.
95,861.—Pencil Attachment.—Edward Weissenborn, Hudson City, N. J.
95,862.—Machinery for the Manufacture of Felt.—Milton D. Whipple, Cambridge, Mass., assignor to James T. Sanford, New York city.
95,863.—Machine for the Manufacture of Felt.—Milton D. Whipple, Cambridge, Mass., assignor to J. T. Sanford, New York city.
95,864.—Harvester.—R. M. Williams, Rockville, Md.
95,865.—Lock.—S. N. Brooks, Bernardston, Mass., administrator of the estate of Linus Yale, Jr., deceased.
95,866.—Carbon Tool.—Hugh Young, Middletown, Conn., and J. L. Young, New York city.
95,867.—Car-Axle Bearing.—Louis Brauer, Washington, D. C.

REISSUES.

15,753.—Oven.—Dated Sept. 23, 1856; reissue 3,666.—Hosea Ball, New York city.
92,934.—Method of Preserving the Aromatic Principle of Hops.—Dated July 27, 1869; reissue 3,667.—E. D. Brainard, Albany, N. Y.
94,073.—Manufacture of Soap.—Dated August 24, 1869; reissue 3,668.—W. T. Bush, Union City, Tenn.
79,639.—Gang Plow.—Dated July 7, 1868; reissue 3,669.—G. A. Davison, San Leandro, Cal.
90,433.—Needle Sharpener.—Dated May 25, 1869; reissue 3,670.—A. S. Dinsmore, New York city.
13,369.—Method of Operating Steam Valves.—Dated July 31, 1855; antedated March 1, 1855; extended 7 years; reissue 3,671.—O. T. Earle, Norwalk, Conn., assignor of N. W. Wheeler.
53,957.—Tire Tightener.—Dated April 17, 1866; reissue 3,672.—James Orr, Hampden township, Pa., assignee of P. Daniels.
85,847.—Stalk Cutter.—Dated Jan. 12, 1869; reissue 3,673.—R. B. Parks and J. R. Parks, Neponset, Ill.
85,713.—Composition for Artificial Stone.—Dated Jan. 5, 1869; reissue 3,674.—E. Westermayr, Chicago, Ill.

DESIGNS.

3,708.—Foot Lathe.—J. W. Baldwin, Laconia, N. H.
3,709.—Elevated Oven Range.—A. F. Barry (assignor to himself and I. G. Lane), New York city.
3,710.—Bottle.—W. A. Candee and W. C. Richards, Bristol, Conn.
3,711.—Trade Mark.—B. C. Smith, Auburn, N. Y., assignor to Hayden and Leitchworth.
3,712.—Return Bend.—G. F. Stone, Baltimore, Md.

MANUFACTURING, MINING, AND RAILROAD ITEMS.

During the past four years the revenue derived from the rentage of docks and slips in New York amouted to $1,309,740. Of this sum $410,261 were collected during the present year.

The first known account of the air-gun is in the *Elemens d'Artillerie* of David Rivant, the preceptor of Louis XIII. The invention is there ascribed to Martin, of Lisieux, who presented one to Henry IV., of France.

It is calculated that for every million pounds of raw silk produced in France, 250 million pounds weight of leaves are consumed, and that five million trees of the average age of thirty years are stripped to furnish them.

A geological survey of Georgia is commenced. C. W. Howard has been employed by the Superintendent of the State Railroad to make a survey of the southern slope of Lookout Mountain in search of iron, coal, and petroleum oil.

The Minnesota lumbermen are making preparations for logging next winter. Many have already sent up teams and men to prepare the camps, cut out the roads, and make such other preparations as are necessary before the crews of men arrive in the fall.

Chicago has introduced mounted letter-carriers. The experiment is begun with ten men and ten horses. A new division of the city into districts has also been made. It is expected that by these arrangements the mail delivery will be better executed than heretofore.

Chief Justice Perley, of the Supreme Judicial Court of New Hampshire, has recently ruled that where property is transported over a railroad line composed of several distinct roads, the original company, which received it, is liable for the loss or injury, should any occur, whether the damage be on its own road or any other.

Application will be made to the Parliament of Canada, at its next session, to incorporate a company for the purpose of making a tunnel under the Detroit river, to connect the Great Western Railroad with the Michigan Central, and to secure to other roads terminating either in Hudson or Detroit, the use of the same on fair terms.

General Sylvanus Thayer, of South Braintree, Mass., has given $10,000 to Dartmouth College, making a total of $60,000 given by him for the purpose of founding, in connection with the college, the Thayer School of Civil Engineering. He has also given the college $1,000 as a foundation for two prizes, for proficiency in the higher mathematics.

In making a shaft for the new Thames Tunnel, a rotten leather bag was found containing about 300 silver twopenny, fourpenny, and sixpenny pieces of the reigns of Henry III., of England, and Alexander VII., of Scotland. Just above where these coins were found a broad and well-paved road was come upon which was evidently, centuries ago, one of the main routes from Thames street to Tower Keep.

The law passed at the last session of the Massashusetts Legislature, prohibiting the running of cars of any description on the railroads of that State without a brake, went into effect on October 1, and the penalty for its infraction is $100. On the Concord Railroad in Nashua the side tracks are full of freight cars, many of them laden, which the lower roads refuse to run, as they have no breaks attached.

M. Brugère introduces a new kind of gunpowder consisting of fifty-four parts of picrate of ammonia and forty-six parts of nitrate of potassa. He also gives a mixture of twenty-five grms. of picrate of ammonia, sixty seven grms. of nitrate of baryta, and eight grms. of sulphur as an excellent substitute for Bengal light, and as suitable for signal and port lights, and, since hardly any smoke is emitted and no unpleasant smell is given off, for use in theaters.

During the last five or six months the engineers employed by the Central Underground Railroad Company have been actively engaged in making their examinations and surveys; and toward the close of the present month, or early the ensuing one, they will be prepared to present their reports. No engineering difficulty has been encountered. The work will be commenced as soon as the plans under consideration can be matured in detail, and the contracts for the various kinds of material required and work to be performed can be awarded to responsible parties on satisfactory terms.

NEW PUBLICATIONS.

Henry Ward Beecher's Sermons are published weekly, in pamphlet form, by J. B. Ford & Co., No. 39 Nassau street, New York city. Price 10 cents. They are worth having and worth reading.

City Subscribers.—The Scientific American will be delivered in every part of the city at $3·50 a year. Single copies for sale at all the News Stands in this city, Brooklyn, Jersey City and Williamsburg, and by most of the News Dealers in the United States.

Subscribers—who wish to have their volumes bound, can send them to this office. The charge for binding is $1.50 per volume. The amount should be remitted in advance, and the volumes will be sent as soon as they are bound.

Receipts—When money is paid at the office for subscriptions, a receipt for it will be given; but when subscribers remit their money by mail, they may consider the arrival of the first paper a *bona-fide* acknowledgment of their funds.

Advertisements.

The value of the Scientific American as an advertising medium cannot be over estimated. Its circulation is ten times greater than that of any similar journal now published. It goes into all the States and Territories, and is read in all the principal libraries and reading-rooms of the world. We invite the attention of those who wish to make their business known to the annexed rates. A business man wants something more than to see his advertisement in a printed newspaper. He wants circulation. If it is worth 25 cents per line to advertise in a paper of three thousand circulation, it is worth $2·50 per line to advertise in one of thirty thousand.

RATES OF ADVERTISING.

Back Page.................................$1·00 *a line.*
Inside Page................................75 *cents a line.*

Engravings may head advertisements at the same rate per line, by measurement, as the letter-press.