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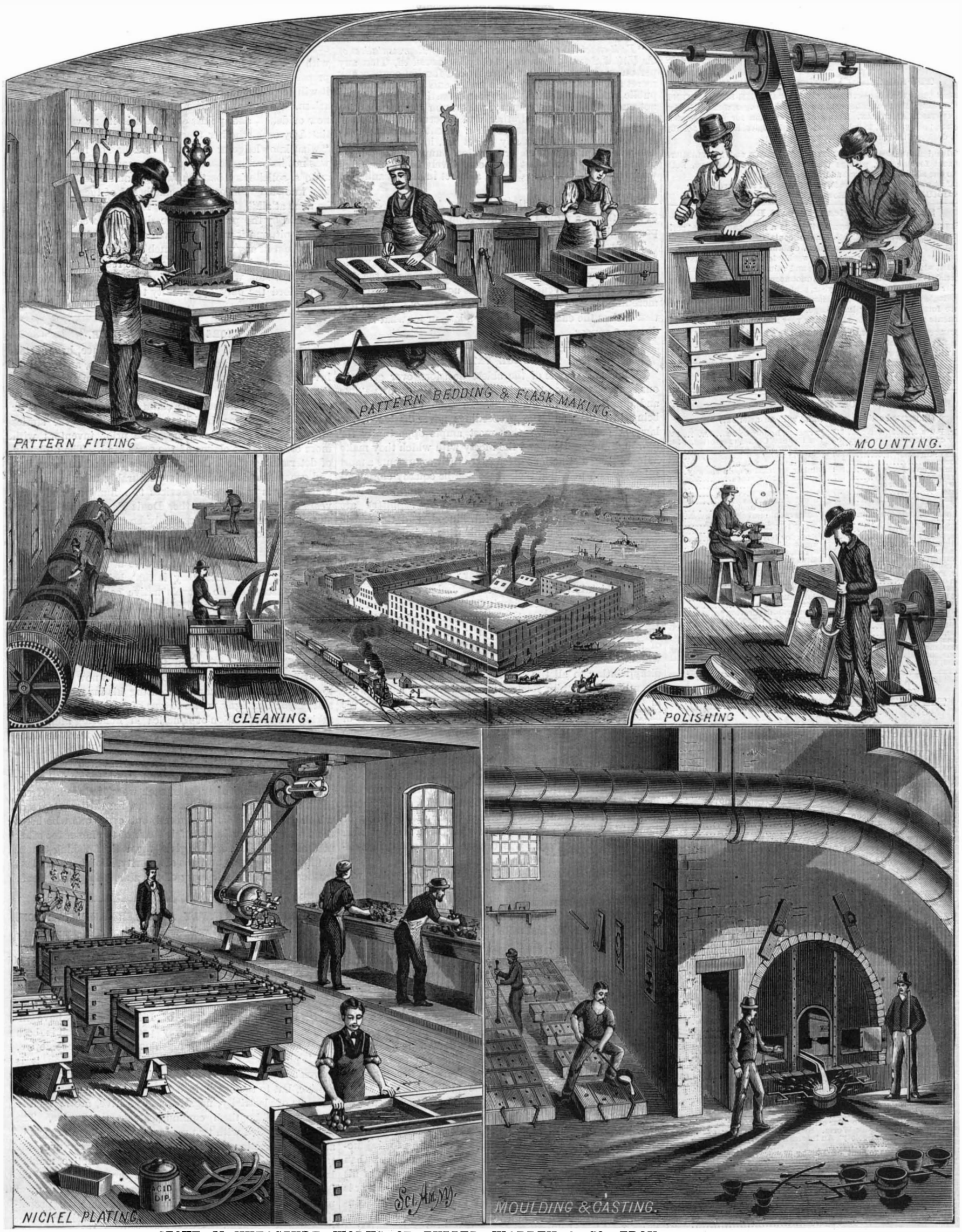

STOVE MANUFACTURE—WORKS OF FULLER WARREN & CO.. TROY. N. Y.—[See page 340.]

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Contents.

(Illustrated articles are marked with an asterisk.)

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THE SCIENTIFIC AMERICAN SUPPLEMENT
No. 230,
For the Week ending May 29, 1880.

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PATENTS FOR NOT INVENTING.

The constitutional authority for the patent laws of the United States rests on Section 8 of Article 1 of the Constitution, which provides that Congress shall have power "to promote the progress of science and useful arts by securing for limited times to authors and inventors the exclusive right to their respective writings and discoveries."

The section of the revised statutes which describes what inventions may be patented carefully limits them to such as are new and useful, and the patentee must in all cases be the inventor or his heirs at law. This has been the policy and practice of the Patent Office from the beginning; and it would seem to be the only one authorized by the Constitution.

The House Committee on Patents, however, appear to think differently, as they have just reported back favorably Mr. Casey Young's bill (H. R. No. 3,041) offering patents to such as are not inventors, for the introduction of inventions which are not new. The bill reads as follows:

"*Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,* That any person or persons who introduce from a foreign country any secret art, invention, or process useful and important to the public, and not patented there, and at the time of application not understood in this country, may, upon payment of the fees required by law, and other due proceedings had as in the case of new inventions, obtain a patent therefor. And it is hereby declared that any secret art, invention, or process which has been used or practiced, unpatented, for the period of fifty years last past exclusively in the country where obtained, shall be deemed a secret in the meaning of this act."

As was pointed out in the SCIENTIFIC AMERICAN, January 31 last, this is a radical departure from the policy and purpose of all our patent legislation hitherto.

The propriety of granting such great privileges is as doubtful as is the authority of Congress to do it. And it would certainly be a strange way to encourage progress in the useful arts to place inventors of what is new on a level with the mere importer of what is at least fifty years old. Who it is that desires the enactment of such a law, or for what reason, does not appear.

THE PAGE PATENTS.

Undoubtedly some of the ablest decisions ever given in our courts have been those involving the validity of patents and questions of infringement. In such cases, the trials being in equity, and the proceedings never hastened, the lawyers generally have the most ample opportunity for thorough preparation, and the nicety with which they make hair-splitting distinctions often gives their arguments a most subtle flavor, provided their reasoning be equally close, and the reader or listener be not interested therein in the matter of dollars and cents. Speciousness and sophistry are nowhere else more cunningly introduced, and the courts need to exercise the utmost discrimination to hold the scales with so even a balance that exact justice will be done.

Among the closely reasoned decisions in patent cases which the records of our courts have shown in late years, several which have been rendered by Judge Samuel Blatchford, of the United States Circuit Court for the Southern District of New York, are particularly conspicuous for their keen analysis of the points in controversy, their close application of the law and the evidence, and the subtle reasoning by which conclusions have been reached that were oftentimes disappointing to all the parties concerned. The decision recently made by him relative to a petition for a rehearing in the Page patent case is a paper of this character. We have heretofore presented a pretty thorough exposition of the points originally at issue in the suit of the Western Union Telegraph Company against the Holmes Burglar Alarm Company, as well as the grounds on which were based the petition of the American Union Telegraph Company, and several railroad corporations, for a rehearing, after the decision in the original suit had been rendered, but before the filing of the interlocutory decree. The case in favor of the petitioners was presented by an imposing array of able counsel, but their prayer was denied by the court, in a decision filed on the 7th of May.

In the original decree the validity of the Page patent was sustained as respects its 11th, 12th, and 13th claims, for the retractile spring, armature, and set spring, found in electro-telegraphic machines, and the defendant was declared to infringe by "making and selling telegraphic burglar alarms in which a circuit breaker acts automatically to break the circuit, so that by the movement of an armature to and from an electro-magnet a bell is rapidly struck by a hammer, and which alarms contain the inventions covered by said three claims." Without going over all the points made by the petitioners, it will be sufficient to say that, although the defendant did not use the inventions named on long or main circuits, and their application by the defendant was somewhat different from the way in which they are used in general telegraphing, yet the petitioners feared a decree would be issued which would enable the plaintiff, the Western Union Telegraph Company, to enjoin them from the use of somewhat similar devices in a quite different way, and for other purposes. It is no unusual result of a long-contested patent suit to find a successful plaintiff applying for injunctions against a much wider field of alleged infringers than he had first contemplated as coming within the scope of his patent, and making it appear that the decision in his favor is far more general in its application than a strict legal construction of the language employed by the court would warrant. Looking at the matter in this light, the presentation of the petition, the offers to show proof on points not fully presented in the original trial, and the able arguments made, will undoubtedly serve a useful purpose, even though the prayer of the petitioners has been denied, for the manner in which the court suggests the limitations of the previous decree, defines the points upon which it was made, and refers to the record, will make it difficult for the plaintiffs to give it any wider application than in the matter of these burglar alarms, which the defendant has, except to a small extent, ceased to make in the way specified.

The court, it is true, refuses to indicate what would be its decision in case suit was brought relative to infringement in an apparatus used for telegraphing on long or main circuits, but, while pointing out that the petition is before the court from corporations not parties to the suit, who would have ample and proper opportunity to defend themselves when directly sued, when their new and additional evidence might be legitimately introduced, makes the following significant declaration: "It is quite sufficient to say that whenever the defendant shall use what is suggested in connection with a long or main circuit for telegraphing, and shall be proceeded against for doing so, an issue will be raised which it will be proper then to consider, but that *no such issue has* arisen." The court takes no cognizance of the proposed new evidence, and points out that it is in no way substantiated by oath whether there is any new evidence or not, or "what knowledge or information is had or not had," that was not before in possession of the court; the offer is only as to a solicitor's "best knowledge and belief," and "the best knowledge, information, and belief of the solicitor may be none at all." The matters of fact and of law sought to be raised by the petitioners are declared to be not in issue in the suit, and it would be a wrong to the plaintiff to consider them in any way to give such construction to the patent as does not legitimately arise from the record, and it is held that a new suit, where the petitioners are parties in interest, will afford the only opportunity to bring in these further issues.

HONORS TO AN INVENTOR.

The authorities of the city of Blois, France, have determined to erect a monument to Denis Papin, an ingenious inventor of the seventeenth century, for whom it is claimed the honor of having made the first useful application of steam power. Whether this claim can be substantiated or not is doubtful, for, besides uncertainty as to the stories about Papin's inventions, there are prior inventors with more or less vague claims of the same kind. The difficulty of determining who is first with inventions of our own day and generation is increased immeasurably when a question of priority is raised as to devices two hundred and more years old. However, whether Denis Papin made the first steamboat or not, he was certainly an ingenious and useful inventor, who, with others, paved the way for the many useful applications of steam to industrial work since devised, and it is conceded on all sides that he at least invented the lever safety valve. His story is that, being a victim of religious persecution, he left his native country, and, while living in Germany, about 1707, invented and constructed a steamboat, on which he and his family embarked, with the intention of exhibiting it on the Weser and then taking it to England. His invention was destroyed by the Mariners' Guild of the Weser, who had the monopoly of navigating that river; but his native town of Blois has now determined to erect a monument commemorating his inventive genius, and Mayor Chavigny writes to one of our daily newspapers asking the co-operation of America in honoring him. The *Public Ledger* properly adds: No injustice need be done Newcomen, Savery, Watt, Fitch, Oliver Evans, Fulton, Stevens, or others who, within the next hundred years, reinvented and improved engines and steamboats until really practicable and useful types of each were produced. Great inventions are almost always growths, the earlier stages of which can scarcely be recognized, but every one who helps them along is deserving of a fair share of the honor too often paid only to the man who gives them the finishing touch. Without going into questions of priority, Blois has abundant reasons to honor the memory of the almost forgotten Denis Papin.

THE ELECTRIC RAILWAY AN AMERICAN INVENTION.

On page 137, present volume of this paper, appeared illustrations and descriptions of Siemens' electrical railway motor, which was operated at the Berlin Exhibition in 1879. Since that publication our attention has been directed to a similar plan described in the SCIENTIFIC AMERICAN as long ago as September 25, 1847, which reads as follows:

Mr. Lilly and Dr. Colton, of Pittsburg, Pa., have invented a new method of railway propulsion, which is both novel and ingenious. The machine is a small locomotive, and is placed upon a circular railway, around which it is driven by electricity. The power is applied not to the locomotive, but to the *track*, in a very curious manner. Two currents of electricity, negative and positive, are applied to the rails, and by them communicate to the engine. The latter is provided with two magnets, which, by a process of alternate attraction and repulsion, drive the car over the track. A piece of lead is placed on the locomotive, making in all a weight of ten pounds, and on the application of the battery, the machine moved with astonishing rapidity up a plane inclined about five degrees. Heretofore the propelling power had been used on the car itself—in this instance, however, the power is placed on the rails, and an engineer

might remain in one town, and with his battery send a locomotive and train to any distance required.

It would seem from the above that the idea of railway car propulsion by electricity was projected in this country more than thirty years before Mr. Siemens' motor was introduced to the public.

PROF. TICE'S THEORY OF CYCLONES.

In reporting the results of his observations along the track of the tornado which proved so fatally destructive at Marshfield, Missouri, Prof. Tice, of St. Louis, expresses the opinion that all such whirlwinds, so called, are electrical storms, not wind storms. There was, he says, no wind attending the Marshfield tornado. Among the evidence of the electrical nature of that storm he notes the fact that it destroyed every building which had a tin roof or which had any metal of any kind in its roof. In Marshfield, it passed directly over several buildings with shingle roofs, and tore to fragments others, not more exposed, which had metal roofs. A mill, situated over a quarter of a mile away from the center of the cyclone, had its iron chimney torn out and carried a long distance, while the mill itself suffered very little damage. The cupola of the public school building at Marshfield, which had a tin roof, was wrecked, but the building, which was roofed with shingles, was not injured to any extent.

Even more conclusive and remarkable, he thinks, were the phenomena manifested in connection with trees and shrubbery. The bark was stripped from the trees and bushes not alone on those sides exposed to the force of the cyclone, but on all sides. The ends of the branches were not only denuded of their leaves and bark, but were rifted into fine fibers, so that they presented the appearance of little brooms. The active agent in such cases, he insists, was not wind, but electricity. Under its influence the sap under the bark was instantly converted into vapor or gas, expanding two thousand times in volume, and, as by an explosion, threw off the bark, shattered the trunk, and split the green twigs into fibers. That this is what took place is, he says, conclusively proved "by the fact that the dead and dry limbs and twigs were not affected, and though in immediate contact with green ones, remained intact."

General evidence of the electrical character of all tornadoes is found by Prof. Tice in the circumstance that, as a rule, they follow railroads and water courses, and either begin or expend their greatest energy upon them.

This, however, may be only a matter of topography. Rivers and railways usually follow the easiest grades, and these would naturally be followed by wind rushes taking the same general direction. It is a noticeable fact, all the same, that the cyclone which destroyed Marshfield followed the St. Louis and San Francisco Railroad for a distance of 145 miles, and lapped up all the water in the ponds and rivers in its course from where it commenced in Arkansas to where it terminated in Missouri.

NEW ATLANTIC SEAPORT IN FRANCE.

BY GEORGE L. CATLIN, LATE U. S. COMMERCIAL AGENT, LA ROCHELLE.

Prominent among the great public works projected by the French government, with a view to the commercial regeneration of France, is the construction of a new seaport at La Rochelle, at an estimated cost of 15,000,000 francs.

Owing to the building of a dike across the present harbor of that city by Cardinal Richelieu, during the famous siege of 1628, the accumulation of two centuries and a half's deposits of mud and sediment have so choked up the port that, with the exception of a channel twenty or thirty feet wide, it is bare at low water, necessitating a system of locks and basins constructed and maintained at great expense.

La Rochelle has from her earliest days (she dates from the 12th century) been renowned as an enterprising maritime city, and for two centuries previous to the war of secession her commerce with the United States, especially in wines and brandies, was active and important. Even with the above mentioned and continually increasing disadvantages to contend with, she has continued to maintain extensive commercial relations with the principal ports of Western and Northern Europe. Two lines of steamers keep up regular and frequent communication with Bilbao and the Spanish iron mines in the Cantabrian Pyrenees; there are lines of steamers to Bordeaux, to Cardiff, to Newcastle, and large annual importations are also made from North Germany, Norway, and Newfoundland. With this spirit of commercial enterprise still struggling for recognition, it was not to be supposed that the Rochellais would remain inactive in face of the renewed impulse which the present spirit of French institutions imparts.

After long consultation and careful scientific inquiry, it has been determined that but one sure method exists for obviating the present evil and restoring La Rochelle to her former maritime prestige, namely, the creation of a new port of entry within easy distance of the city, yet entirely independent of the harbor which Richelieu so effectually blocked.

Fortunately, nature, seeming to have foreseen and provided for this need, offers remarkable facilities for the construction of such a port about three-quarters of a mile north of the entrance to the present harbor, and at a point where communication with the city and the railroad system converging to it is easy and simple. At the point in question, known as the *Mare* (pond) *à La Besse*, there exists a natural inlet or depression which, by comparatively little labor, may be dug to the requisite depth and walled in by quays. This inlet opens upon a deep roadstead, known as the Pallice, completely sheltered from the sea by the islands of Ré and Oleron, between which vessels must pass to enter it. When, on the one hand, one considers the facilities which this point, above all others on the French coast, offers for direct communication in a straight unbroken course with New York and the other American seaports, without any of the dangers incident to channel navigation; and, on the other hand, the fact that from La Rochelle direct lines of railway radiate to Paris, to the interior and east of France, to Bordeaux, and to all points along the coast, both north and south, it will be seen at a glance that this grand undertaking promises to prove prolific in results to the commercial world. The work will be begun in June, 1880.

LEGISLATING ON COLOR BLINDNESS.

The Legislature of the State of Connecticut has passed an act authorizing the State Board of Health to prepare rules and regulations for the examination and re-examination of railroad employes in respect to color blindness and visual power, and prescribes the method in which and the intervals at which such examinations shall be made. The act further makes provision for inflicting penalties on any railway company employing persons who are not in possession of a certificate from the examining board of their freedom from color blindness. The examiners may revoke the certificate at any time. The State Board is, in the month of May, to recommend two or more medical experts to make the necessary examinations, and the Governor is to appoint two of these gentlemen on the following first of July. It is to be hoped that other States will adopt similar measures for protecting the traveling public against the dangers incident to the visual defect of railroad employes.

NEW YORK ACADEMY OF SCIENCES.

[*Continued from page* 321.]

The paper on the theory of cloud bursts, by Mr. William Ferrel, of the United States Coast Survey, has an especial interest at this season of excessive meteorological disturbance in the West. Cloud bursts, Mr. Ferrel said, always occur in the interior of a tornado. The primary cause of a tornado is difference of density arising from difference of temperature between the internal central part and the surrounding parts of the atmosphere. This only occurs on an unstable state of the air, in which the temperature of the surrounding air decreases more rapidly with altitude than the interior ascending column. Since the interior ascending column diminishes with altitude less rapidly than the surrounding quiescent air, this interior part is much warmer, and, consequently, ascends very rapidly, and the air from surrounding parts flows in below to supply the ascending current, as in the case of a chimney when the interior once becomes warmer than the surrounding air without. In addition to this difference of temperature and density, the air must have an initial gyratory motion, almost imperceptible, it may be, at a short distance from the center, but as it is drawn in it runs into rapid gyrations near the center, just as in the case of water running through a small hole in the bottom of a basin of water. If the gyrations above and below had the same velocity, the violence of the gyrations and the pressure toward the center below would depend upon differences of temperature only between the interior and exterior parts. But on account of the great friction near the earth's surface, the gyrations are much retarded there, and, consequently, the centrifugal force which prevents the rush of the air, in some measure, toward the center. If the difference of barometric pressure between the central and external parts were 30 millimeters, and no centrifugal force below or friction to resist this pressure, according to the laws of spouting fluids the ascending current in the interior would be about 80 meters per second. If the gyrating velocity below were only one-half as much as above, the centrifugal force would be only one-quarter as much, and supposing that this and friction were to resist one-half of the pressure below toward the center, we should still have residual pressure which would cause an ascending velocity of about 56 meters per second.

This theoretical velocity is obtained upon no extravagant assumptions, and that such velocities do exist in tornadoes is confirmed by observations of their mechanical effects. It will only be necessary to refer to one well authenticated case of this sort, given in the Signal Service report, at Mount Carmel, Ill., 1877. The ascending currents of a tornado carried a church steeple, gilded ball, and vane, 15 miles. This must have been kept suspended in the air by the ascending currents 20 or 30 minutes. If saturated air at a temperature of 30° at surface ascends with a velocity of 50 meters per second, rain to the amount of 1·2 millimeters per second falls from the first 2,000 meters of altitude—equivalent to 0·3 inch per minute, or 18 inches per hour. At such a rate, if the tornado could be kept over the same spot for a short time from any cause, it would be called a cloud burst.

At higher altitudes than 2,000 meters it may be supposed that the vapor and rain is scattered out from the center and falls over a larger area. But rain may not only fall from clouds at this enormous rate, but an immense amount may be kept suspended in the air. Drops of 0·1 inch may be kept suspended in the air by a current of about 23 feet per second. Of course, the amount of rain kept so suspended increases the pressure in the center, and so much diminishes the force and energy of the tornado. Our assumed velocity of 50 meters per second arises from a difference of pressure of less than 15 millimeters. Suppose, now, rain enough was contained in the cloud to reduce this difference to 5 millimeters. This would require rain to the depth of 136 millimeters, more than 5 inches. The difference of pressure of 5 millimeters yet remaining would give an ascending current of about 32 meters per second, which is four times more than is necessary to keep the rain suspended in the air. If, now, for any reason, the whole system should be suddenly broken up, as, for instance, when the tornado strikes against a mountain side, and the ascending current by which the 5 inches of rain is kept suspended is suddenly cut off, of course, the whole amount would drop to the earth in a short time.

Lieutenant-Commander A. A. Michelson described some novel and interesting observations on sunlight seen through a narrow slit. As the width of the slit is diminished the diffraction bands spread out and separate, until finally nothing is seen but the central bright space. At this stage the width of the slit is about one or two hundredths of a millimeter. It will be observed that the light has acquired a faint bluish tint. If a Nicol prism be placed between the slit and the eye, and the prism be rotated, it will also be found that the light shows traces of polarization. Further, when the light is faintest, the bluish tint is most decided. On still further diminishing the width of the slit, the bluish tint becomes more apparent, and on applying the Nicol prism the polarization is quite decided, the tint when the light is faintest being deep blue. When the width of the slit has been reduced to about 0·001 millimeter, the tint changes to violet, the polarization appears to be complete, and on turning the prism the tint becomes a more decided violet, until finally the light disappears. If the prism and the slit be interchanged, the same results follow in the same order as before. The material of which the edges of the slit are composed does not seem to affect the result. Slits made of iron, brass, and obsidian were employed. With the latter more perfect results were obtained than with the others, probably, however, because the edges were more perfect.

This experiment, Mr. Michelson said, may be varied, and the results shown in a very striking manner, by using a double image prism, when the two images may be compared side by side. The experiments are trying to the eyes on account of the faintness of the light. The conditions under which the phenomena may be best observed are: 1. The sun to be observed directly, holding the slit as close as possible to the eye. 2. A double prism is to be employed, so that the faint and the bright images may be observed side by side. 3. The width of the slit should be between the one hundredth and one thousandth of a millimeter. 4. The edges of the slit should be as nearly perfect as possible The explanation has suggested itself that the polarization may be accounted for by considering that the greater part of the light which reaches the eye has been reflected from the edges of the slit.

The fact that the plane of polarization is at right angles to the length of the slit would seem to confirm this. The objections to this explanation are: First, that there should then be a difference in the behavior of different materials. Second, the polarization should be exhibited when the slit is wide as well as when it is narrow. These experiments seem to prove, first, that light in passing through a very narrow slit is partly or completely polarized in a plane at right angles to the slit; second, that such a slit allows the shorter waves of light to pass more freely than the longer ones.

It is proper here to express our indebtedness, in making these gleanings, to the ample reports of the papers read, published by the New York *Times*, the only one of our great dailies that paid any attention to the meeting of the Academy.

The Berlin Fish Show.

The International Fishery Exhibition, which opened in Berlin April 20, has proved a splendid success; and it is gratifying to read in the German and English reports that the exhibits sent out by the United States form in every respect the most remarkable collection in the Exhibition. The floating hatchery "Fish Hawk" attracts especial attention.

In his opening address, the German Minister of Agriculture, Dr. Lucius, said that the Fisheries Society, through whose efforts the holding of the Exhibition was due, had met with the most obliging support, not only in Germany itself, but in nearly all the neighboring countries, and even in the furthermost zones of the earth. From the Baltic and the German Ocean, the ice bound seas of the north, from the coasts of Holland and England, from the Switzer lakes, from the exhaustless riches of the Mediterranean, from the Volga and the Black Sea, from North and South America, from the coasts of the far East, from India, China, Japan, and the Malay Archipelago—the fauna of the waters had been brought in rare and wonderful profusion, with an endless variety of pearls, shells, and corals.

A Metallic Shower.

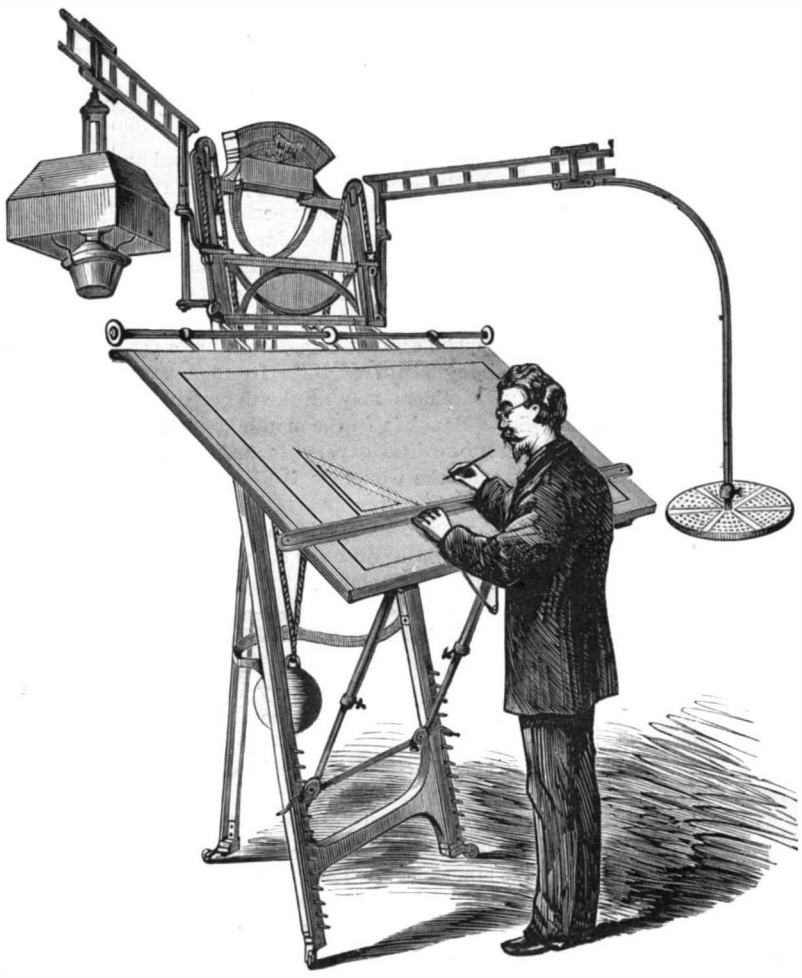
For several hours, on the night of March 29, a fall of rain mingled with meteoric dust occurred at Catania, Sicily. The dust contained fragments of iron, either in a pure metallic state or in metallic particles surrounded by an oxidized crust. The fragments were of many shapes and sizes, and were readily attracted by the magnet. They only differed in size from a shower of aerolites.

Such shows of meteoric dust are probably not infrequent, though it is seldom that they are so clearly indicated in southern lands. In high latitudes they are shown by frequent and well marked discolorations of the earth's snowy mantle in places where terrestrial dust is a practical impossibility.

NEW DRAUGHTSMAN'S EASEL.

It is well known that draughtsmen, engravers, lithographers, and persons having similar occupations, suffer very much on account of the cramped and unhealthy position they necessarily assume while working on an ordinary table. Mr. G. Boudriot, of Hagen, Germany, has invented an easel which avoids the most serious defects of the ordinary draughting table, and is very convenient. It can be adjusted to almost any desired position. It is represented in the annexed engraving, taken from the *Leipziger Illustrirte Zeitung*. The drawing board is suspended from two sliding frames by ropes passing over pulleys on the top of the easel, and it is balanced by a ball weight attached to the ropes, as shown in the engraving.

The board can be inclined at any desired angle by means of adjustable telescoping struts. The easel is provided with adjustable arms, carrying sliding carriages, from one of which a lamp is suspended. A small table for the instruments is suspended from the other. The easel can be adjusted to suit persons of different heights and to accommodate different kinds of work. This table is easily constructed, and it seems to be very convenient and well arranged.



IMPROVED DRAUGHTSMAN'S EASEL.

NEW METHOD OF OPERATING MINING PUMPS.

Our engraving illustrates a novel arrangement for supplying power from a central station to a number of contiguous mines. The invention consists in the employment of hydraulic pressure, generated by steam or water power, and one or more pressure accumulators, the water under pressure being conveyed through pipes to the different mines, where it is used for operating pumps, hoisting and blowing machinery. It is then returned through pipes to a water tank, from which it is again pumped into the accumulator to be used over again.

In operating the pumps at the mines a strong bracket is secured to the ordinary spear or pump rods. A ram or upright hydraulic cylinder is placed under each bracket, so that the piston rod of the cylinder will strike the under side of the bracket, and lift the pump rod when the piston rises. A branch pipe is connected with the hydraulic cylinder below the piston. A waste pipe leads from the hydraulic cylinder to a water tank at the central station, from which the water is pumped into an accumulator. A valve is arranged in the length of the branch pipe near the hydraulic cylinder, and another in the waste pipe; and these valves are operated automatically by the motion of the pump rods so as to open and close alternately, thus admitting the water to and discharging it from the cylinders, giving the pump rods a vertical reciprocating motion.

By this means an entire mining district, when the mines are conveniently situated, can be supplied with a cheaper and more reliable power than when separate engines are used, and the mines will at all times have command of a larger surplus of power, because two or more engines can be maintained at the central station, each of which is sufficient for ordinary work, so that in case one should become disabled the other could be used. By this arrangement, should any of the mines strike a body of water suddenly, then at once the surplus power can be drawn to that particular mine to operate upon the surplus water. Should the power still be inadequate it would take but a short time to add another pump to pump into the same accumulator, and thus furnish all the power required by a drowned mine.

This invention was recently patented by Messrs. Moore & Dickey, of San Francisco, Cal.

Strong Hose Pipe.

At a recent meeting of the Edinburgh Association of Science and Arts, a short communication was made by Mr. William Firth on the use of India rubber hose for steam and high pressure purposes, and exhibited a piece of canvas and rubber hose capable of withstanding a pressure of 4,000 lb. to the square inch, and also several other pieces of canvas and rubber packing, which, he said, were most useful for engineers. Several members spoke favorably of the novel points embodied in Mr. Firth's communication.

MECHANICAL INVENTIONS.

Mr. Richard E. Wilcox, of Hartford, Conn., has patented an improved drill-chuck, so constructed as to hold the work firmly and allow it to be easily inserted and removed. The work is held by the front ends of the jaws, which are made to open or close by turning the exterior case of the chuck.

An improved spark arrester, patented by Mr. Daniel B. Stalker, of New Petersburg, O., consists of three cylindrical wire screens set concentrically one within another, and fixed in a vertical position on the top of a boiler smokestack, and provided with caps and tubes and other devices for aiding in arresting and disposing of the sparks and cinders that may escape from the stack.

Mr. Harrison W. Holley, of Lynchburg, Va., has patented an improvement on a machine for rolling and cutting tobacco for which the same inventor received letters patent No. 209,808, dated November 12, 1878.

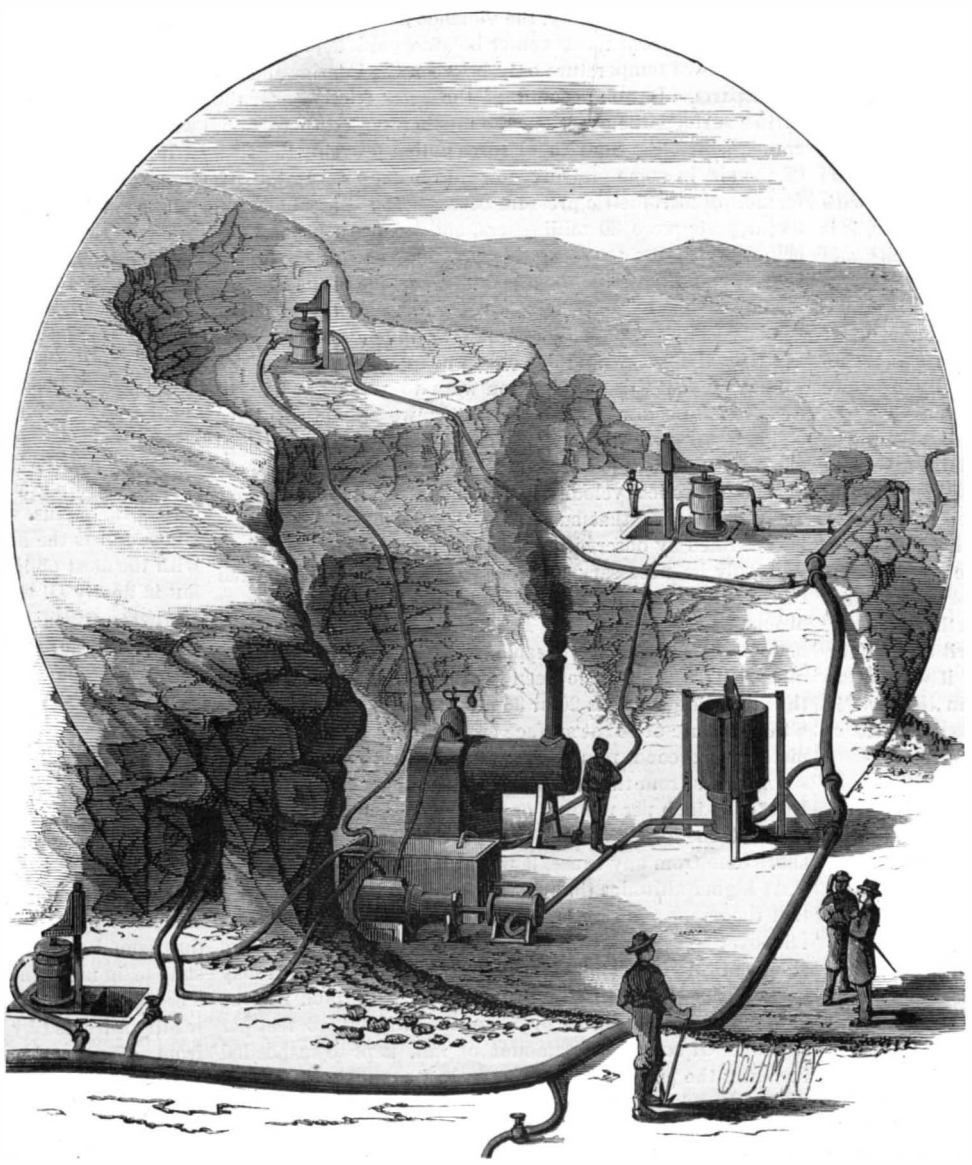
An improved machine for making plug tobacco has been patented by Mr. Edward T. Pollard, of Lynchburg, Va. The object of the invention is to provide means whereby the tobacco may be fed on the inside of a single belt, rolled in a continuous sheet, and cut into plugs; also, to provide means for keeping clean the surface of the large roll over which the tobacco is carried and the inner face of the belt.

Mr. Amos A. Burr, of Rockdale, N. Y., has patented an improved saw so constructed that it cannot be forced forward should its teeth strike a knot or other hard spot in the wood.

An improved wagon brake has been patented by Messrs. John F. Talley and John M. Wadlington, of Uptonville, Ky. The object of this invention is to furnish brakes for wagons and other vehicles so constructed that they may be applied automatically whenever the horses cease to draw.

Mr. Reuben F. Krohn, of Sunbury, Pa., has patented a simple and effective self-coupler whereby cars can be coupled or uncoupled and the link removed without going between the cars.

An improvement in feathering paddle wheels has been patented by Messrs. Thomas C. Pratt and Herman J. S. Lewis, of Grafton, N. Y. The object of this invention is to furnish paddle wheels which shall be so constructed that the paddles will adjust themselves automatically to bear equally against the water when moving through one part of the revolution and edgewise when moving through the other part of the revolution, so that the most of the power may be utilized for the propulsion of the vessel.



IMPROVED METHOD OF OPERATING PUMPS.

The Little Snow Plow.

Mountain locomotives have two enemies—the falling rock and the snow slide. Both these are successfully vanquished by means of a simple invention termed "the little snow plow." It consists of a concave triangular piece of boiler iron, which fits snugly over the pilot. It is perhaps two feet in height, with a sharp angle in front, and sides which reach backward and outward over the rails. It tosses aside with the utmost ease a foot or two of snow, and so demoralizes an ordinary drift that an engine has no difficulty in passing through. But the peculiar forte of these iron shields is wrestling with huge rocks and bowlders which these warm spring days detach from the mountain sides. Rolling down the slippery banks and lodging squarely upon the track, these savage rocks seem fully bent upon wrecking the trains and landing the passengers in the eddies of the river. The train comes sweeping around the curve all unconscious of the perilous bowlder, and the watchful eyes of the engineer catches a glimpse of the fatal train-wrecker too late to avert the danger. But the little snow plow is wide awake and ready for business. Backed by the ponderous engines and swift-moving train, it catches the rock and hurls it twenty, forty, fifty feet into the air. Rocks that weigh five hundred pounds are thrown as easily as the foot trips a pebble from the sidewalk. Engine 181, with one of these plows, cleared the track of a bowlder which weighed over half a ton. There is no shock which is perceptible to those on the train, but when the next station is reached the heavy iron on the little snow plow is found to be dented as if it had been struck by a cannon ball.—*Truckee Republican.*

Brown Stone as a Fire Resister.

Notice was taken a short time ago of the investigations of Dr. Cutting, State Geologist of Vermont, in determining the relative power of different granites to withstand the action of fire. He has since examined and reported upon the class of building stones known as brown stones, free stones, and sandstones. He found them to withstand heat much better than granite. Of the twenty-three specimens tested, not one was injured at 600°, and only three were slightly injured at 800°. At 900° the effects of the heat were very generally and seriously shown, but so many as seven varieties were reported as "standing well" temperatures even

higher than 1,000° Fah. "Montrose stone," from Ulster county, N. Y., is one of those which stood the test of 1,000°. These investigations were made at the instance of the *Underwriter*.

AGRICULTURAL INVENTIONS.

An improved seed planting machine, patented by Mr. Albert Dart, of Richmond, Va., consists in combining with a seed dropper mechanism a flat rimmed wheel and rim grooved roll, and in arranging a supporting wheel on a two-part shaft between the two sections of a seeder.

An improvement in the class of cotton choppers having one or more hoes operated by a crank or similar means, and working across the rows of plants, or at right angles to the direction in which the machine advances, has been patented by Mr. John T. Sustaire, of Matthews, N. C.

Mr. Benjamin M. Watts, of Phœnix, Arizona Ter., has patented a portable baling press, which is so constructed as to be moved from place to place about a field in which hay has been cut, and bale the hay as it lies in the windrows, where it has been left by the rakes. There is no necessity of bringing the hay to the press or transporting and stacking a quantity in one place, so as to save moving the press. This is the prime or paramount object of the invention, the peculiar combination and construction being such that these results are obtained by the minimum of expenditure of time, labor, and money.

Mr. Robert L. Turner, of Olena, Ohio, has patented an improved hand hoe of that form in which a short handle carries a bent blade adapted to universal use in the cutting away of grass or manipulating the soil about plants; and it consists in the peculiar form of the blade, which is constructed of a main body portion setting off to one side of the longitudinal axis of the handle in a parallel plane therewith, and a curved or upturned end portion, which, as well as the main portion, is sharp upon both edges.

Mr. George Metcalf, of Lelend, Ill., has patented a cheap and simple machine for grinding feed for cattle, horses, etc., that is designed more particularly to be operated by windmills having a crank motion.

Mr. Samuel Huber, of Danville, Pa., has patented a plow colter to be attached to the inner or furrow face of the plow beam in such a manner that the colter shall cut the grass from the edge of the turf that is to be turned over by the plow, so that the grass shall not protrude upward between the turned furrows.

Alisoff's Copying Process.

Instead of using a tray filled with a compound to receive the ink, M. Alisoff employs sheets of prepared paper. This polygraphic paper is prepared in the following manner: Sized or unsized paper is coated on one side with a composition consisting of glue, or gelatine, glycerine, soap, and water, approximately in the following proportions, which have been found to give good results in practice: 80 pounds animal glue or gelatine, 20 pounds glycerine, 20 pounds soap, 200 pounds water.

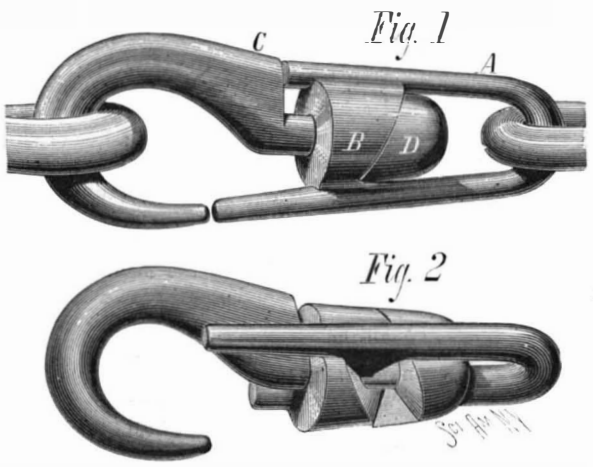
The paper thus prepared may occasionally be found to be too sticky for use, which will depend on the surrounding temperature and the quality of the materials employed. To obviate this objection wash the prepared paper with a solution of alum, the strength of which can only be determined by experiments in each case. The "polygraphic paper" may be of different thicknesses, and if not transparent may be made so, if desired, by any of the ordinary and well known means. The aniline ink, found to give the best results for written documents, is prepared by preference by dissolving about 1 pound of aniline of commerce in about 1¼ pounds of alcohol, and adding thereto, when dissolved, as much water as is necessary to render it sufficiently fluid. It may then be bottled for use.

In producing the "matrix" the patentee takes a sheet of prepared or "polygraphic" paper, and lays it on a sheet of damp flannel or cloth placed upon a zinc plate or an oil paper. He sponges it with clean water, or, in hot weather, with water containing a little alum, and places the dry original upon the peepared paper. Over that he places another piece of damp flannel zinc, or oil paper, and puts the whole pile into an ordinary copying press. A good matrix can be obtained by mere pressure of the hands without a press, although a press is preferable. The text must be written, drawn, or printed with aniline ink, taking care that the pen be quite clean and always full of ink. The ink when dry ought to shine like a metallic surface. In taking copies from the "matrix" after having detached the original therefrom, the patentee places a sheet of ordinary paper in the place of the original, and proceeds in the same way as when producing the matrix; but if copies or "matrices" are to be taken from 2, 4, 6, or 8 pages at once he places a sheet of damped "polygraphic paper" on each page with damp flannels and zinc sheets between the leaves of "polygraphic paper," and proceeds in the way above described.

The polygraphic paper may be bound into copying books which can be used like ordinary copying books made of tissue paper, and copies on ordinary paper may be taken from the "matrices" thus preserved, even after a considerable time. After a few copies have been taken the written text can be read from the reverse side of the "matrix," as in ordinary copying books. Should it be found desirable to obtain manifold copies of printed matter this may be accomplished by employing in combination with "polygraphic" or prepared paper, aniline printing ink, prepared in the following manner: Take equal parts by weight of aniline and glycerine and boil them together till the aniline is dissolved, and the composition has attained sufficient consistency to be used in the manner of printer's ink. Ink so prepared will be found particularly useful for printing the headings of letters, bills of lading, declarations, letters of invitation, circulars, and other documents containing both written and printed matter, since if aniline ink be used for both the printing and writing the copies will contain both the printed and written matter, while heretofore only the writing could be copied, the printing ink hitherto employed not being transferable.

NEW SELF-LOCKING HOOK.

We give herewith an engraving of an improved self-locking hook recently patented by Mr. Joel R. Haines, of Mount Laurel, N. J. These hooks are so constructed that the weight of traces or any other tension or strain will hold them securely locked, so that they cannot accidentally become unhooked.



HAINES' SELF-LOCKING HOOK.

Fig. 1 shows the hook in its normal condition, and Fig. 2 represents it as unfastened.

The two arms of the loop, A, are connected by a collar, B, having on one of its sides two ratchet or clutch teeth, which are engaged by two similar teeth on the head, D, on the shank of the hook, C.

The shank is capable of turning in the collar, B, and as it is turned it is retracted by the action of the inclined faces of the ratchet teeth on the collars, D B, and when strain is put on the hook the tendency of these inclined faces is to turn the hook in the opposite direction.

The ends of the loop, A, are elongated so as to project beyond the collar, B, one arm projecting far enough to nearly touch the point of the hook when locked; the other arm nearly touches the shoulder at C.

Any longitudinal strain tends to keep the hook fastened, and it can be unfastened only by relieving it from strain. This device is applicable not only to harness, but to all kinds of rigging and tackle employing ropes, chains, or straps.

All communications in relation to this invention should be addressed to Mr. Louis T. Derouse, Camden, N. J.

NEW REFRIGERATING COVER.

The annexed engraving represents an improved refrigerating cover recently patented by Mr. Abijah North, of Champlain, Clinton County, N. Y. It is designed to be placed over victuals or over dishes containing them, and may be made so small and compact that it may be conveniently used on the table for cooling butter and other articles.

NORTH'S REFRIGERATING COVER.

The invention consists of a can having in its lower portion an annular chamber, A, upon which rests a pan, B, which does not quite cover it, and in the pan is placed a basin of perforated metal or wire cloth for containing the ice. The entire device is closed by a cover at the top, and made air-tight or nearly so at the bottom by a ring of rubber tubing that surrounds the lower edge of the annular chamber, A. As the ice melts in the basin, C, the water drops into the pan, B, from which it runs into the annular chamber, A. The chamber is provided with a small outlet for air, and with a faucet for drawing off the water accumulating in it.

This refrigerating cover may be placed over small dishes or over articles contained by larger dishes, as shown in the engraving. It will be noticed that both the ice and the ice-cold water resulting from the melting of the ice are utilized in refrigeration.

Astronomical Notes.

OBSERVATORY OF VASSAR COLLEGE.

The computations in the following notes are by students of Vassar College. Although merely approximate, they will enable the observer to recognize the planets. M. M.

POSITIONS OF PLANETS FOR JUNE, 1880.

Mercury.

On June 1 Mercury rises at 4h. 26m. A.M., and sets at 7h. 21m. P.M.

Mercury is approaching its greatest eastern elongation, and should be looked for after the 15th of the month, in the evening twilight, about 2° north of the point of sunset.

On June 30 Mercury rises at 6h. 34m. A.M., and sets at 9h. 7m. P.M.

Venus.

Venus is approaching superior conjunction, and is so nearly in range with the sun that it is not likely to be seen during June.

Mars.

Mars is more and more distant from us; but its reddish light enables one to distinguish it from the stars.

On June 1 Mars sets at 10h. 50m. P.M.

Mars will be seen near the new moon on the 11th; the moon will pass east of Mars and below the planet in altitude.

Jupiter.

On June 1 Jupiter rises at 1h. 53m. A.M.

It is near the waning moon on the morning of June 2.

On June 30 Jupiter rises at 0h. 10m.

It is in conjunction with the moon; the moon passes north of the planet. This planet is now near enough for us to examine the changes of its satellites.

On the morning of June 22, between 2 and 4, the first satellite and its shadow may be seen on the disk of Jupiter.

Saturn.

On June 1 Saturn rises at 2h. 28m. A.M.

Saturn passes the star Omicron Piscium on the 7th. The star is one degree further north in declination.

On June 30 Saturn rises at 0h. 40m. A.M., closely following Jupiter, about three degrees further north.

Uranus.

Uranus rises on June 1 at 11h. 8m. A.M., and sets at 23m. after midnight.

On June 30 Uranus rises at 9h. 18m. A.M., and sets at 10h. 31m. P.M.

Uranus is moving away from the star Rho Leonis in right ascension, and approaching it in declination. It is about one degree east of the star.

A telescope of four inches aperture will show that Uranus has a pale greenish-white disk; it appears like a very small full moon.

Sun Spots.

The long period of quiet on the sun's surface has ended. The spots follow one another now in rapid succession. A group composed of some dozen spots was approaching the western limb of the sun late in April, when there entered upon the eastern limb a large and densely black spot, surrounded by the usual gray bordering, and accompanied by several others smaller in size. This is undoubtedly a return of that seen about the middle of April; the different members so numerous at that time seem to have united. This spot should be looked for early in June.

Hydraulic Mining on a Railway.

Recently heavy slides of earth seriously obstructed the track of the Central Pacific Railway above Alta, California. The mass of earth to be removed was so great that by ordinary methods several weeks would have been required to clear it away. In the emergency hydraulic miners were called upon for help. They brought up their pipes and monitors, constructed a flume from a ditch which was, fortunately, near at hand, and in fourteen hours piped away a body of *débris* which had been the despair of picks and shovels. The tremendous power of hydraulic mining was thus exhibited in a very practical way. Those who witnessed the swift dispatch of this avalanche of earth have attained, says the Sacramento *Union*, a lively perception of the effects produced upon the bluffs which contain the gravel deposits. It is, indeed, somewhat singular, the *Union* continues, that the hydraulic monitor has never been used in making cuts on railways where the soil is sufficiently soft to be piped. It might be thought that in such cases there would be great economy in the application of water power, for a strong head of water directed by an experienced hand will cut out and carry away more dirt in one day than fifty men could shovel and pick in a week.

AMERICAN INDUSTRIES.—No. 43.

THE MANUFACTURE OF STOVES, RANGES, AND HEATERS.

Perhaps no one thing has contributed so generally and positively to the increased comfort of American homes as the great improvements which have been effected in the stove manufacture within the lifetime of men who are not yet old. The business does not cover all branches of the house-heating service, but it is the most important one, and one in which the products very largely go to supply the wants of the common and middle classes of people. In fact there are none so poor now, in this country at least, but they have the advantages of stove heating to make their apartments comfortable and for cooking purposes, and our mechanics and laboring men generally are now more comfortably protected against the cold in their living rooms than were the richest and most favored a hundred years ago.

For family and office stoves, and for nearly all kinds of ranges, heaters, and furnaces of the present improved construction, the world is indebted almost exclusively to American inventive genius and mechanical skill. German and Dutch stoves of rude contrivance were first used, and Benjamin Franklin made an improvement on these in what he styled his "Pennsylvania fireplace." One of his arguments for them, as given in his quaint language, was: "If you sit near the fire, you have not that cold draught of uncomfortable air nipping your back and heels, as when before common fires, by which many catch cold, being scorched before, and, as it were, froze behind." But we have made great progress in the stove manufacture since Franklin's time, and probably there is not another firm in the country which has been more conspicuously identified with this advancement than that of Fuller, Warren & Co., whose extensive works, known as the Clinton Stove Works, at Troy, N. Y., are illustrated on the first page of this paper. The business of which they are the direct successors was founded over half a century ago, when cooking stoves were in the first stages of their development, and from that time to this the house has occupied a leading position, not only as regards the improved patterns of stoves they manufacture, but in the care and nicety with which the parts are finished and made to fit and work easily. In the latter particular their stoves have always been conceded by the trade to have especial excellence, whether in the cheaper or the more costly kinds.

In our illustrations, the views in the center and on the right hand side at the top show where the patterns are prepared for the moulders, and the flasks made—the latter being the boxes containing the sand in which the moulds are made. But a small portion of the work in getting out patterns is done at the foundry, a huge amount of outside help being constantly employed in this and in getting up new designs. The pattern is first made in wood, and from this a casting is taken, which, after being filed and fitted up with the greatest nicety, is used as a working pattern. These iron patterns are all "bedded," as it is called, or backed up with wood, which is done in the same department as the flask making. One of the most important points in all stove pattern making is to have the patterns of such form and the weight of metal in the various parts so balanced that there will be the least possible liability of the castings to warp and crack with the extreme and sudden variations of temperature to which all stoves are subjected. To guard against this the pattern maker often has to modify designs or change proportions, though it is generally possible to do this in parts of the work which are not seen.

The moulding and casting, which is shown in the view to the left at the bottom, is carried on in four large shops, the buildings for this portion of the work covering two acres and a half of ground. Three cupolas are used daily, from which forty to forty-five tons of iron are run for an average day's work, though the foundry has a capacity sufficient to run as high as sixty tons a day. The best No. 1 American pig is principally used, and two hundred and forty men are employed in this branch of the business. About forty thousand pieces are taken out of the moulds every day. The sand used in moulding is found in large quantities and of excellent quality in the neighborhood. Adjoining the moulding shops is an interior space of about the size of two full city lots, in which are piles of fire pots and rough heavy pieces for heaters and furnaces, where they are placed when taken out of the sand until the other parts are finished. The casting proper, or pouring the metal, is mostly done by carrying the metal by hand to the moulds, but for the large pieces cranes are used to take the molten metal from the furnaces to where the casting is to be made. The running of the metal always takes place between two and four o'clock in the afternoon, the mornings being occupied in preparing the moulds and taking out the castings from the previous day's work.

All the other work, when taken out of the sand, goes to the cleaning room, which is shown in the view to the right in the middle of the page. Thirty men are employed in this department. All of the small pieces, and some of the larger ones, are here milled in drums about the size of a hogshead, revolving at a slow rate of speed, to rub off all of the sand which may adhere to the castings and smooth the rough edges. A great deal of this work is done by hand, which is necessary on most of the large pieces, the men using stiff steel wire brushes. Many machines have been contrived for taking the place of hand work in this department, but no one of them has thus far met with favor in the trade.

The "polishing" room represents the department where the iron work intended for nickel plating is prepared for that process. All such parts, as also the other portions of a stove which are intended to show bright iron without nickel plating, are first ground on emery wheels, and then the parts which are to be nickeled are polished on leather-covered wooden wheels. About one hundred emery wheels are used daily for the finishing of bright parts.

The nickel plating department, as shown in the view on the right at the bottom of the page, represents a portion of the stove making business which was unknown until within the past five years, but during this period the popularity of this style of stove ornamentation has become so pronounced that it is now seen on all classes of work. A large sized Weston electric machine is employed here, and 8,000 to 10,000 pieces are plated per day, requiring the services of fifty men. After nickel plating the pieces are burnished on wheels made of felt and of muslin; the latter consist of enough thicknesses to make the width of the face of the wheel, and the edges of the muslin, when the wheel is revolved at a very high rate of speed, form an efficient burnisher. On some of the stoves now made there are as many as seventy nickel plated pieces.

In the "mounting" room, illustrated in one of the views, the stoves are all put together, the parts being made to fit nicely and work evenly. In the thoroughness with which this final testing of all the preceding operations is done the firm have long had a high reputation. For many years, in their early history, they were the makers of a line of stoves which became celebrated throughout the country, though they have since been to a large extent superseded by more modern patterns.

The designer and patentee of these goods, Mr. P. P. Stewart, gave his entire personal attention to the manufacture, and especially to the mounting, looking over the work in this department every day. It is one of the traditions of the foundry that if he could insert the edge of a piece of paper between an oven door and its frame, the door had to be rehung. The easy working as well as the perfect fit of all dampers and doors and movable pieces of all kinds, is carefully looked after in this department, and when it is remembered that in some of their first-class goods as high as 150 pieces are required in one stove, it will be seen that this is one of the most important divisions of the business. The stoves are all put together before being sent out, except that, in an order for export, it is sometimes, though not often, desired that the parts be packed separately to save freight. In such cases, however, the stoves are all put together at the works, as if for the local trade, and afterward taken apart to box for shipment.

It would require a good deal of space to make even a bare enumeration of all the goods produced by this establishment. They have a wide variety of patterns in some of the best styles ever introduced of stoves, ranges, and heaters, and make, besides, all the tin and copper work required on their premises. What is known as the anti-clinker grate, in stoves for parlor and office use, has met with a good deal of favor during the few years it has been in use. This grate, as is generally known, allows for a space between the upright parts of the fire pot and the grate, in which a poker can be used to remove any clinker that has lodged there. Some of their stoves are made for wood and soft coal, and some for hard coal, while others are calculated for use with either. A large tin shop, not shown in our illustrations, gives employment to fifteen hands; 500 boxes of tin are used here in a year for making stove fittings, with stamping machinery, etc., and for lining reservoirs, oven doors, warming closets, etc. Asbestos and fireproof paint are also used in the linings of oven doors to help retain the heat. Fifty tons of sheet iron are consumed yearly, with a good many tons of sheet copper, used principally for reservoirs. Another considerable department is that in which the japanning is done, in an oven 8 by 14 feet. All the fine pieces go into the oven twice, being carefully coated with a fine brush for the finishing operation. The oven is generally heated to only about 350°, though it is sometimes as high as 500°. All of the bolts and rods used, from five inches up to seven feet long, are made on the premises, but those smaller than this are purchased, although all the door pins used are made in the shop. There is a large storeroom, in which a great stock of stove manufacturers' hardware and supplies is carried, such as bolts, rivets, nuts, oils, paints, varnish, etc., which are issued on requisitions of the different foremen and charged up to the various departments, and the works, which is in what is locally known as South Troy, is connected by telephone with the main office, in the center of the city, from which all its operations are constantly directed.

The general view of the works, in the middle of the page, gives a good idea of their size and capacity. Over 600 men are constantly employed here, besides a large number of outside workmen. A pair of 300 horse power engines, built by William Coutie & Son, of Troy, furnish the power. The premises cover six acres of ground, all of the buildings but the moulding shops being five stories high, and the whole of this space is in constant use for the handling of the immense amount of work all the while going through the establishment. Tracks from the Hudson River, New York Central, Troy and Boston, and Vermont and Canada railroads, run on one side of the foundry, and on the other is the firm's dock on the Hudson river, just opposite the United States Arsenal at West Troy, which may be seen in miniature in the picture. There could not be a more convenient location for obtaining supplies of coal and iron, or for shipping goods, and the iron business has been for so many years a leading feature in that section that almost the whole of the male population have been brought up to and worked all their lives in some one or other specialty of this trade. The stoves made here, besides selling in every part of this country, are exported to almost every quarter of the globe. There is a good demand for them in England, and in Germany, Russia, and Scandinavia; several shipments have been made to Constantinople and other ports on the Mediterranean; some sales have been made in Japan and on the east coast of Asia; a few days ago an order was filled for Australia; and from both the east and west coast of South America considerable trade in this line is now coming here.

Besides their main offices and salesrooms in Troy, occupying three large buildings on River street, they have in New York city, at No. 236 Water street, salesrooms and a large stock of goods always on hand. In Chicago they have an immense warehouse located on the North Pier, and connected by telephone with their offices and salesrooms at No. 56 Lake street. In Cleveland, Ohio, their warehouse and salesrooms are located in the three commodious buildings known as Nos. 76, 78, and 80 River street. And a large stock of their wares is kept at Omaha, Neb., for rapid distribution, by Milton Rogers & Son; and from these central points they are enabled to make distribution of goods with great promptness and dispatch.

Photographic Novelties.

PHOTOGRAPHY APPLIED TO THE BIOSCOPE.

The London *Photographic News* reports the following most recent novelties in photographic discovery. M. Eugène Simmonar has invented a kind of bioscope, in which a portrait is shown with the eyes sometimes open, sometimes shut. The illusion of the same person alternately awake and asleep is very perfect. To obtain this effect, the inventor takes a double photograph of a sitter in exactly the same position, only in the first the eyes are open, in the second closed. From these two negatives prints are taken, one on the right side, the other on the reversed side of the same sheet of paper, in such a way that the two images, when viewed by transmitted light, accurately coincide; this can easily be done by the carbon process. By means of a small instrument arranged for the purpose, the light and reversed sides of the paper are alternately illuminated, and the face is seen with the eyes successively open and shut. Thus the illusion of a person rapidly winking can be perfectly produced.

PHOTOGRAPHIC TOY.

M. Lipman has applied an analogous principle to the production of trinkets, in which are set two photographic miniatures, something similar to those which M. Dagron used to make many years ago. For example, one of the miniatures represents a lady holding her opera glass to her eyes, the other a portrait of the same lady without the glass. By means of a small button acting on a reciprocating motion, one image may be rapidly substituted for the other, and a very good illusion is obtained of the figure raising and lowering the opera glass. Effects of this kind are susceptible of any amount of variation. A large number of highly interesting applications of a similar description would appear to be open to gelatino-bromide plates, especially as their superior over wet collodion plates, as regards sensitiveness, increases enormously the facility for obtaining the desired result.

Steam on the Upper Delaware.

The steamboat Kittatinny, the first that ever reached Port Jervis, N. Y., returned to Delaware Water Gap April 28, without accident, having run the 50 miles in less than five hours. The Kittatinny is 60 feet long, 14 wide, and can carry 70 passengers. The Port Jervis *Union* does not think that the attemp to navigate the Delaware to that point will be permanently successful. It says: The opening the Delaware to steam navigation would uncover one of the most delightful regions in this country. The scenery along the river is grand and picturesque in the extreme. Every mile presents some new and wonderful panorama, and thousands of those who go to the Catskills and Adirondacks for wild landscapes would spend their seasons in this valley if once its beauties were made accessible. The Lehigh and Eastern Railroad will do something toward increasing the travel in this valley, but nothing will ever quite equal the advantages that would be offered by a line of steamers plying between Trenton and Port Jervis. We would like to see all the difficulties removed, and the daily arrival and departure of steamboats to and from Port Jervis; but we know that so long as the Delaware remains a mere big mountain torrent, with treacherous rocks and foaming shoals, the thing cannot be accomplished.

Fall of Meteoric Dust.

Professor Silvestria, of the Catania Observatory, reports the fall, on the night of the 29th of March, of a shower of meteoric dust, mingled with rain. Besides the usual characteristics of color, chemical composition, and the mixture of mineral and organic particles and minute infusoria, there was a considerable proportion of iron, either in a purely metallic state or in metallic particles, coated with oxide. The size varied from a tenth to a hundredth part of a millimeter, and the form was either irregular or spherical, as if it had undergone fusion. This phenomenon was first observed in the Indian Ocean, south of Java, in 1859, and has been corroborated by Professor Nordenskjöld's Arctic observations.

The Self-leveling Ship's Berth.

A special exhibition of the Huston self-leveling berth was given on board the Havana steamer City of Alexandria, April 28. This berth is so hung and balanced as to maintain a level surface whatever may be the rolling or pitching of the vessel. By this means two sources of discomfort during sea-voyages are materially overcome. The new berths are placed like ordinary berths, and take up but little more room; and while they must necessarily partake of the larger motions of the ship they are quite free from sudden pitching and rolling. Many who have used them at sea testify to a complete exemption from sea-sickness while occupying them. And to those who do not suffer from this distressing malady their advantages would seem to be scarcely less marked. They are so well balanced, and keep their level so surely, that their occupants can lie at ease, with no risk of being thrown out by a sudden lurch of the ship. Any one who has been tossed about in an ordinary berth will appreciate the luxury of a level and steady sleeping place during rough weather.

Was it Wind or Lightning?

A suit has been brought in the Circuit Court at Madison, Wisconsin, to collect from an insurance company for damages done by the great storm of 1878. The property was insured against lightning, and the company resist payment on the ground that it was destroyed by wind. The plaintiff hopes to prove by the evidence of members of the Signal Corps that the whirlwind which destroyed his house was of electrical origin. A vast amount of insurance is likely to be affected by the decision of this case, owing to the heavy losses of property during the recent whirlwinds.

River Scenery of Alaska.

Alaska is covered with a network of deep, cool, perennial streams, that flow on, ever fresh and sweet, through grassy plains and mossy bogs and rock bound glacial cañons, telling everywhere, all the way down to the sea, how bountiful are the clouds that fill their ample fountains. Some thirty or forty rivers have been discovered in the Territory, the number varying, as the smaller ones have been called rivers, or creeks, by the mapmakers. But not one of them all, from the mighty Yukon, 2,000 miles long, to the shortest of the mountain torrents falling white from the glaciers, has thus far been explored. Dall, Kennicott, and others have done good work on the Yukon, and miners, trappers, and traders have been over most of the region in a rambling way, and each have brought in detached bits of river knowledge, which, though too often misty and uncertain, have been put together in maps that are better than nothing.

The coast line in particular, with the mouths and lower reaches of the rivers, has been fairly drawn, but their upper courses are in a great part invisible, like mountains with their heads in a cloud. Perhaps about twenty of the Alaska rivers are a hundred miles or more in length. The Stickine is, perhaps, better known than any other river in Alaska, because of its being the way back to the Cassiar gold mines. It is about 350 or 400 miles long, and navigable for small steamers to Glenora, 150 miles, flowing first in a general westerly direction through grassy undulating plains, darkened here and there with patches of evergreens, then curving southward, and receiving numerous tributaries from the north, it enters the coast range and sweeps across it to the sea through a Yosemite valley more than a hundred miles long, and one to three miles wide at the bottom, and from five thousand to eight thousand feet deep, marvelously beautiful and inspiring from end to end. To the appreciative tourist sailing up the river through the midst of it all, the cañon for a distance of about one hundred and ten miles is a gallery of sublime pictures, an unbroken series of majestic mountains, glaciers, falls, cascades, forests, groves, flowery garden spots, grassy meadows in endless variety of form and composition—furniture enough for a dozen Yosemites—while back of the walls, and thousands of feet above them, innumerable peaks and spires, and domes of ice and snow tower grandly into the sky. Sailing along the river the views change with magical rapidity. Wondrous, too, are the changes dependent on the weather. Avalanches from the heights, booming and resounding from side to side; storm winds from the Arctic highlands, sweeping the cañon like a flood and filling the air with ice dust; rocks, glaciers, and forests in spotless white.

In spring the chanting of cascades, the gentle breathing of warm winds, the opening of leaves and flowers, birds building their nests, hundred acre fields of wild roses coming into bloom, and tangles of bramble and huckleberry, swaths of birch and willow creeping up the lower slopes of the walls after the melting snow, massive cumuli piled about the highest peaks, gray rain clouds wreathing the outstanding bows and battlements of the walls. Then the breaking forth of the sun on it all; the shining of the wet leaves, and the river, and the crystal spires of the glaciers; the looming of the white domes in the azure, the serene color grandeur morning and evening, changing in glorious harmony through all the seasons and years.—*San Francisco Bulletin.*

APPARATUS FOR REGISTERING SOLAR RADIATION.

Solar radiation is an element which undoubtedly plays considerable of a *rôle* in meteorological phenomena, and several methods have been employed to automatically register the period during which the sun is shining, the interruptions to radiation caused by clouds, etc. The Meteorological

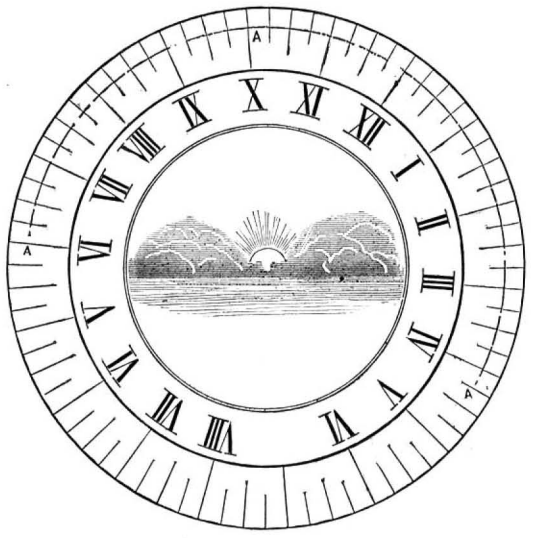


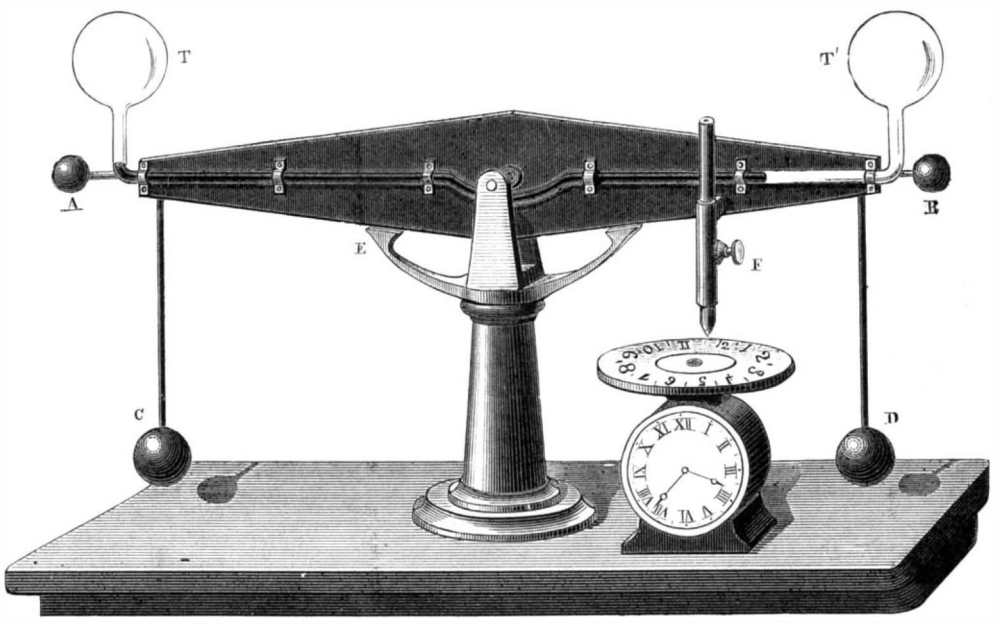
Fig. 2.—TRACING MADE BY APPARATUS FOR REGISTERING SOLAR RADIATION.

Observatory at Kew has in operation an apparatus designed for such a purpose by Campbell. It consists of a glass globe filled with water, forming a lens, and so arranged as to carbonize a strip of paper by concentrating the sun's rays when they traverse the atmosphere. An English physicist, Mr. David Winstanley, has remarkably improved on this system. His apparatus consists of a differential thermometer, T T' (Fig. 1), mounted on the beam of a balance, as shown in the accompanying engraving.

The two bulbs of the thermometer, T T', are covered with lampblack. The bulb, T, to the left is alone exposed to the open air, all the rest being inclosed in a box. When the sun shines the air contained in the bulb, T, dilates, and the mercury in the differential thermometer is driven into the tube, thus destroying the equilibrium of the balance. The beam then inclines, and the point of the pencil, which is fixed to the support, F, rests on a paper circle fastened to a copper disk. This disk keeps constantly revolving on its axis, carrying with it a paper dial like that represented in Fig. 2. When the sun is no longer shining the balance resumes its equilibrium, the pencil ceases to touch the paper, and the tracings made by it are thus broken.

In Fig. 2 the line, A A A, represents what was inscribed by the registering pencil on the 1st of September, 1879. It will be seen that the sun shone from 6 to 7:30 o'clock in the morning; and that from 7:30 to 8 o'clock clouds intervened several times, since the line is broken. In a like manner may be seen the duration and interruptions of radiation up to 4:15, when it was definitely arrested for that day. To complete the description of this ingenious apparatus we will add that the metallic balls, A B, are provided with screws, and serve to place the beam in equilibrium. The rods, C D, are made of metal, and are designed to prevent oscillation.

The tracing, which is reproduced reduced one-half, is a specimen of such as the inventor obtains at his Douglas Observatory in the Isle of Man.



APPARATUS FOR REGISTERING SOLAR RADIATION.

The New Oil Pipe Line.

Describing the oil pipe line now being pushed toward the seaboard, the Hornellsville *Times* says: Its beginning is near Bradford. It pursues a straight line to the east that, if continued, will bring it out near Catskill on the Hudson River. It may bend to the southeast to strike water at New York. It is generally considered that this line is intended to convey oil to the seaboard or some river convenient thereto. By whom it is being pushed through is a puzzle. Report says the project is advanced by the Union Tank Line Company This is undoubtedly a branch or only another name for the Standard Oil Company.

The cost of the undertaking cannot be estimated, but that it is a gigantic enterprise and will cost a vast sum may easily be shown. The tanks at Cameron Mills will cost nearly $10,000. Each of the pumps will weigh sixty-five tons, and will cost $16,000 or more. The engines will consume five to ten tons of coal per day. The pipe is wrought iron and costs $1.20 a foot. Add the cost of surveying, clearing away, laying the pipe, burying it, engine buildings, and a score of other things, and the expenditure, were it known, would seem fabulous.

A new telegraph wire has been put up along the railroad, and a report of progress at various points is daily wired to headquarters. When the line is in operation a full report of the business at each station will daily be telegraphed to the proper officials. Every length of pipe is numbered, and is checked off when put on and taken off of the cars. It is receipted for by the teamster and again by the men who lay it. Every detail in this great scheme is watched and properly recorded and reported.

Chinese Sheet Lead Factories.

The manufacture of sheet lead for the lining of tea chests is an important industry at Hong Kong. The melted lead is pressed into sheets by hand between pairs of large paving tiles smoothly covered with several layers of unsized paper. As he drops the melted lead on one tile the workman quickly presses it into a sheet with the other. The paper being a bad conductor of heat, the lead does not solidify immediately it leaves the ladle; and as by long practice the workman always ladles out exactly the same quantity of lead, the sheets vary but little either in size or thickness. The sheets are afterwards trimmed by hand with large shears.

A New Process for the Treatment of Sulphureted Ores.

A new method of treating gold-bearing sulphurets, by which such ores can be reduced, it is said, at a cost not exceeding $4 a ton, has lately been developed and tested in Philadelphia. The *Record* describes the process as follows: The ore is first passed through a powerful rock-breaker, in which it is broken into small pieces. From here it goes into a pulverizing machine, where it is reduced to grains so fine that they will pass through a sieve running 3,600 holes to the square inch. Thence it is put into the ore roaster. This is the chief feature of the process. It is composed of fire-clay retorts of cylindrical shape, built one above the other in four tiers, the entire structure being fifteen feet high, eight wide, and twelve deep. The heat in the retorts varies, the lower one being the warmest and the upper the coolest. The powdered ore is passed into the rear of the top retort, and is moved slowly along by means of a comb worked by machinery until the front is reached; thence it falls into the retort below, then moves back, and the operation is repeated until the last and bottom retort is reached; when it passes out, the whole operation consuming about four hours. By this process the sulphur is burnt out of the ores, the base metals are oxidized, and the gold is left in a free metallic state.

After this the ore, having been cooled, goes into an automatic amalgamator. Here it is treated with hot fumes of mercury, which instantly attach themselves to the precious metals and amalgamate every particle of the free gold in the ore. By the other processes numberless small pieces of gold, which have not gravity enough to attach to the plates, float away and are lost. With the use of hot mercury, however, these small particles are rolled into globules and are consequently saved. Again, when ordinarily treated, small portions of gold become coated with copper and iron, and are thus lost. In this process, however, such a coating is stripped off by the action of the hot mercury, a condition of amalgamation which is never accomplished when cold mercury is employed.

After passing from the amalgamator the ore is thoroughly cooled and then thrown into settling pans filled with water, which are kept agitated for the purpose of settling the quicksilver containing the gold. This is next placed in a retort, where the mercury is separated from the precious metals.

The Canadian Canal System.

The Canadian canal system now comprises the following sections: First, the Welland Canal from Lake Erie to Lake Ontario. Thence the route is across Lake Ontario itself to Kingston, where the navigation of the river St. Lawrence begins. As is well known, remarks a *Herald* correspondent, sent especially to study the Canadian canals, this river along its upper portion, owing to numerous rapids, is unfit for continuous navigation. Hence at various points these rapids are avoided by canals, the vessels passing back from them to the river. These are the Galop Canal, the Rapide Plat Canal, the Farran's Point Canal, the Cornwall Canal, the Beauharnais Canal, and the Lachine Canal, where the river is reached at Montreal, and ocean navigation begins. When it is remembered that the Erie Canal is 350 miles long to Albany, and has 72 locks, a table showing the superiority of the Canadian route in the matter of plain sailing will be instructive, since with 365¼ miles it reaches ocean navigation:

	Canal Navigation. Miles.	Free Navigation. Miles.
Welland Canal	27	—
Lake Ontario	—	160
River St. Lawrence	—	66⅝
Galop Canal	7⅝	—
River St. Lawrence	—	4½
Rapide Plat Canal	4	—
River St. Lawrence	—	10½
Farran's Point Canal	¾	—
River St Lawrence	—	5
Cornwall Canal	11½	—
Lake St. Francis	—	32¾
Beauharnais Canal	11¾	—
Lake St. Louis	—	15¼
Lachine Canal	8½	—
Totals	70⅝	294⅝

From Lake Erie to Montreal, 365¼ miles.

This route has only 54 locks. It can accommodate vessels of nearly three times the tonnage of those on the Erie Canal. It can remain open to navigation about the same length of time. It has 9 feet of water in the lowest of its locks, against 6 feet in those of the Erie Canal. This refers to the Canadian water route as it is.

As the Canadian water route is intended to be these already superior conditions will be greatly increased. To begin, the minimum size of the locks is to be 270 feet by 45 feet, with 14 feet of water on the miter sills. The enlargement of the Welland Canal will shorten the distance one mile, with one lock less besides. At the Galop Rapids it is proposed by submarine operations to lower the bed of the river from 10 feet to 16 feet, so that vessels descending need not pass through the Galop Canal at all. A contract has been issued for this work. The entire system of river and canal navigation is to be made available for vessels drawing 14 feet, dredging in the former case being necessary. No clear sketch of the work has been completed yet, and all the prospective benefits remain therefore unrealized.

NEW SPORTING GUN.

Until quite recently guns of the class shown in our engravings were imported, but we are now able to produce on this side of the Atlantic guns that are not only fully equal to the best English make, but also a great deal cheaper.

The gun shown in our engravings is unquestionably one of the best breech-loading sporting guns in market. It is manufactured at Colt's armory by the best and finest machinery, and is as good a specimen of mechanical work as one would wish to see. The parts are interchangeable, and so accurately made that parts of different guns may be intermixed and a gun may be put together from parts taken haphazard. The lock is of the rebounding style, and the firing pins are without springs. The entire mechanism is exceedingly simple, yet each part performs its office perfectly.

The action bolt, A, which retains the barrel in its place, is moved by a lever, B, through the medium of internal parts not shown in the engraving. This bolt engages two hooks on the barrels and retains the barrels rigidly in place.

The bolt, C, carrying the shell extractors is engaged by a cam, D, on the bolt, connecting the stock and the barrel, and when the barrel is released by drawing the action bolt, A, and tipped as shown in Fig. 1, the shell extractor is operated.

The stocks to these guns are made of any desired style of English or Circassian walnut or other choice wood, and the guns can be furnished with any grade of finish. Patterns are furnished with the guns if desired, and the guns are guaranteed to make the pattern furnished. Each gun is thoroughly tested at the factory, and none but absolutely perfect ones are placed on sale.

We have recently examined samples of these fine guns from the establishment of Messrs. Hodgkins & Haigh, 300 Broadway, New York city, who keep an assortment of them on exhibition and for sale.

FIG. 2.—LONGITUDINAL SECTION OF BREECH-LOADING GUN.

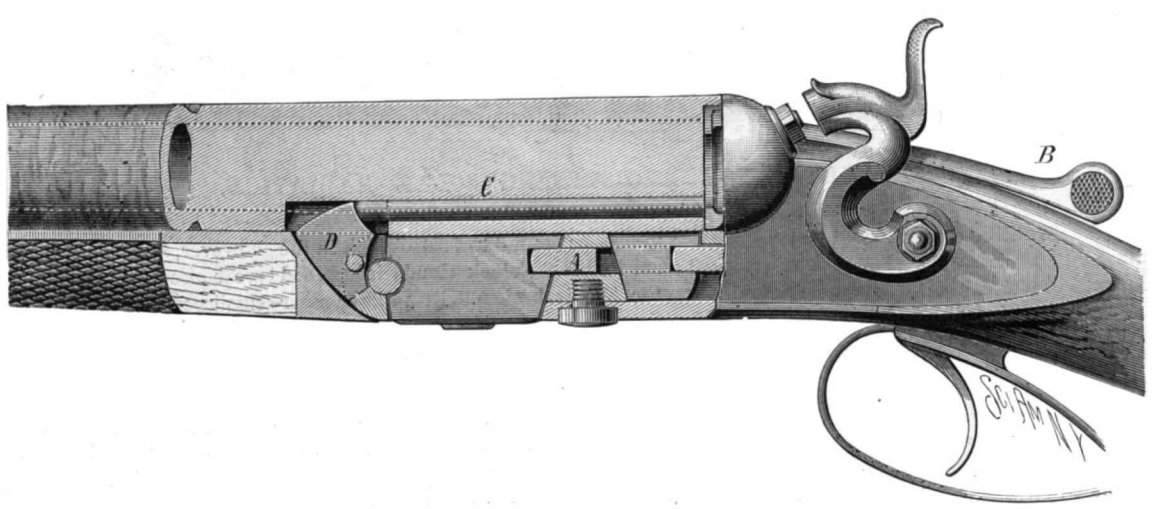
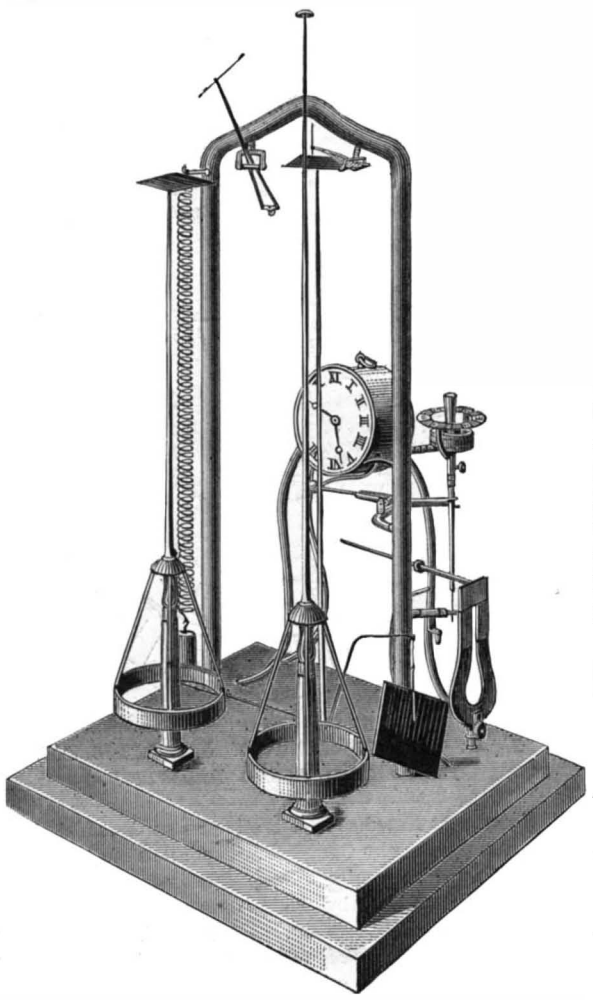


FIG. 1.—COLT'S DOUBLE BARRELED BREECH-LOADING SPORTING GUN

APPARATUS FOR RECORDING EARTHQUAKE MOVEMENTS.

The accompanying cut, taken from *La Nature*, represents an ingenious seismograph invented by M. Ignazio Galli, of the Meteorological Observatory at Velletri, Italy. It consists of six separate devices for observing and recording automatically the horizontal and vertical amplitude of earth tremors, the direction of the earthquake movement, the time of the shock, and the intensity of the attending magnetic disturbance. At the nearest corner of the marble base is a short standard of metal, on the top of which rests an agate cap, balanced by a metal ring below, and carrying above a long, slender vertical rod, the whole forming a sensitive pendulum. At the top of the rod is a small silver mirror, carrying a fine needle, the movements of which are observed through a small telescope. Any movement of the base is so magnified at the upper end of the rod that the minutest tremors of the earth are thus made visible.



GALLI'S SEISMOGRAPH.

The system next to the left is substantially the same, save that the vertical rod is shorter and carries at top a sheet of paper covered with lampblack. Resting on this blackened paper is the fine needle of a nicely balanced lever attached to the brass support which arches over the middle of the base. As the earth tremor causes the paper to move the relative extent and character of the movement are marked by the needle on its blackened surface. Behind this part of the apparatus is a weight suspended by a sensitive spiral spring. At the bottom of the weight is a lever, to the other end of which a needle is suspended by a hair, the point of the needle resting on a sheet of blackened paper slightly inclined. This is for measuring the vertical height of the earth movement. Its operation is obvious.

The direction of the movement is marked by the needle of the lever attached near the upper right hand corner of the frame, on the sheet of blackened paper on the top of the rod which rises from the middle of the base.

To ascertain the quarter whence the movement proceeds and the time of the shock, a truncated metal cone is inverted and balanced on a horizontal metal disk surrounded by a ring marked with the cardinal points. The instant the apparatus is moved the cone tips against that side of the ring whence the motion proceeds, and in falling acts upon a lever which stops the clock, thus indicating at once the direction of the source of the shock and the time of its occurrence. The intensity of the accompanying magnetic disturbance is measured by the magnet and its attachments. This seismograph is inclosed in a glass case, is small, extremely sensitive, and records the slightest tremors of the earth with great precision.

MISCELLANEOUS INVENTIONS.

An easel for holding drawing boards and other similar articles, which is so arranged that the board or other article can be set in a horizontal position or at any desired inclination, and can also be revolved so as to present the drawing or other object in different positions for the purpose of facilitating the work on the object, has been patented by Mr. Isaac Wilkins, Jr., of Greenpoint, N. Y.

An improved scarf, which can easily be changed so that either end of it may be attached to the neck band, has been patented by Mr. Werner W. Fichtenberg, of New York city. Both ends of the scarf are alike, and provided with a neck band having its end fastened to a small plate, which is pivoted to a button that is arranged to slide on a thin rod or a wire fastened to the rear side of the scarf.

Mr. John T. Rossetti, of Brownsville, Texas, has patented a pendant for a watch which can be turned in every direction and can be screwed into the watch case. The pendants made heretofore could be turned forward and backward in one direction only, and were not screwed into the case, but soldered to it, and were liable to break off.

Mr. Samuel M. Rhoads, of Jeffersonville, Pa., has patented a simple and durable shaft or pole coupling for vehicles. The invention consists in combining with the cushion of a thill coupling a box having a recess and back piece, a separate axle clip, and a screw-threaded cap having ears that clasp the box.

An improved corset clasp, patented by Mr. William McCabe, of New York city, consists in forming the hook plate with a spring tongue to prevent the accidental separation of the hooks and eyes after they have been fastened.

Mr. Charles H. O'Connor, of Brooklyn, N.Y., has patented a process for the manufacture of flexible non-inflammable paper, or for the treatment of paper to render it non-inflammable; that is to say, saturating paper wholly or partially unsized with a solution of silicate of soda of low specific gravity, and subsequently drying the paper.

Mr. John B. Weir, of Otsego Lake, Mich., has patented an improved calk plate for boots and shoes which is both simple and effective. It consists of a metal plate covering the heel and sole, provided with calks on the lower side and lugs, which fit into corresponding recesses in the sole on the upper side. It is secured to the heel of the boot or shoe by means of a countersunk screw, which takes in a threaded plate and socket in the heel.

Mr. Thomas B. Baldwin, of Troy, Pa., has patented a parlor cooking stove with two fireplaces, so arranged that the one may be used simply for heating purposes, and the other be used simply for cooking purposes.

Mr. Robert Cunningham, of Brooklyn, N. Y., has patented an improved process of ornamentation, consisting in fixing the ornament in the desired position with some suitable adhesive substance or fastening, and then pouring over the entire surface of the ornament and its support a sufficient quantity of transparent alcohol copal varnish to cover and imbed the ornament.

THE DECORATING SPIDER CRAB.

A. W. ROBERTS.

Society and occupation in the world of the sea are represented by masons, builders, marauders, usurpers, and plunderers, and all have their distinguishing peculiarities. A fancy of the quaint spider crab, or "dandy crab," as he is sometimes called, is to decorate himself with algæ and sponges; and none but the most brilliant in color seem to please him; this, however, not for vain display, but, primarily at least, for personal protection. He moves about "slowly and solemn," and is deliberate in decision and determined in purpose; his hard, spiny shell, of somber color, adds to the dignity of his appearance, and the methodical way in which he uses his claws and carries himself about, really impresses one with the idea that he is quite an important personage in the aquarium.

When wishing to array himself he finds a brilliant algæ or sponge, and pinches off piece after piece with his long, slender claws; these, when broken, are dipped in a glutinous fluid contained in the mouth, and are carried to the back and fastened securely. Sometimes after he has attached a particular fragment, he reaches back his claw a second time to satisfy himself that it is secure.

This practice is indulged in only when the crabs are young, and in the fall, and its object is to obscure the crab from hungry sturgeons and skates. When placed in a tank with many animals the crabs take the same precaution against possible enemies, and often cover themselves.

Full-grown crabs are too large and hard to be swallowed, and are seldom seen fastening seaweeds to their backs, as they no longer have need of such protective covering.

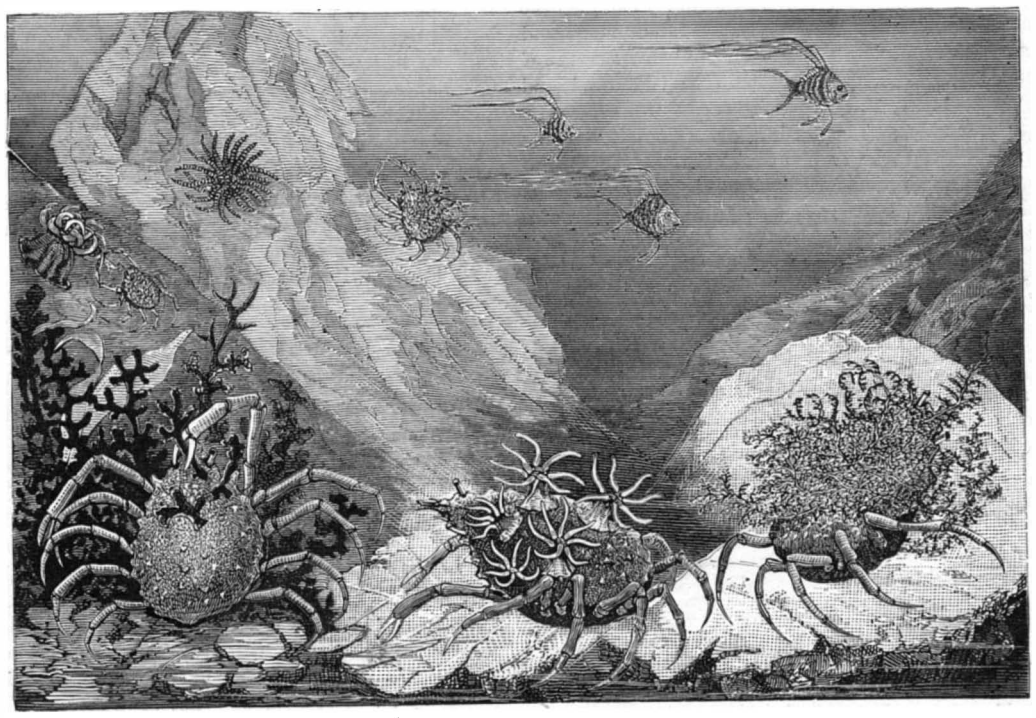
There is an old mill race on Long Island where many of these crabs have been carried among sponge-covered rocks whence they cannot return. Dainty bits of red and yellow sponges have been attached to their backs, which have grown so as to nearly cover them. When in motion the crabs look like moving sponges. Although much preferring brilliant algæ and sponges, the spider-crab will, for lack of them, make use of other material. Not long ago a tank was cleaned in the aquarium, and a spider crab was confined in one corner with a pane of glass. I threw in sprays of sertularia and bits of the bases of anemones. These were eagerly seized by the crab and attached to his back. In course of time the bits of anemones developed into perfect animals, and remained on the shell till the crab reached the period of casting.

The spiders cast their shells like the rest of crabdom, but unlike other varieties have no attendant to protect them when soft. Two that were nearly ready to shed in one of the tanks at the aquarium, suddenly broke loose from their shells on the tank's receiving a sudden jar. The crabs are less pugnacious than the hermit and other crabs, appearing to quarrel only over their food. They have keen appetites and good noses for scenting food. I have often amused visitors at the aquarium by holding a dead minnow in my hand. The crabs would assemble from all parts of the tank, and climb up my arm and cluster about my hand in numbers in search of the minnow, after having fierce contests with one another.

More curious than this is the fact that they will deliberately seat themselves on the largest sized anemone when feeding, and with their claws will deliberately take the food out of the stomach of the anemone.

I have often seen the spider crab attack a scallop in open shell. The scallop would close suddenly and hold the crab captive for several hours.

There is a specimen of the long-armed spider crab of Japan in the cabinet of Rutgers College, N. J., which measures, when the limbs are extended, eleven feet and six inches. This variety is the largest known.



THE DECORATING SPIDER CRAB

THE PAINTED TURTLE.

C. FEW SEISS.

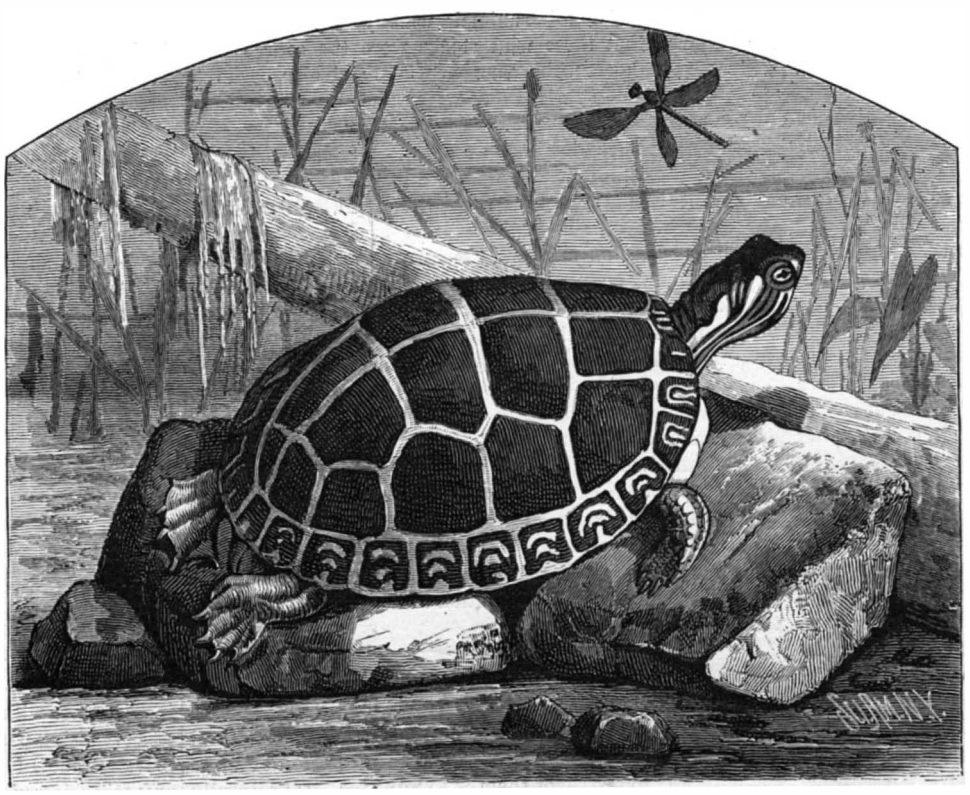
The painted turtle (*Chrysemys picta* (Herm.), Gray) may be found in many of our ponds, lakes, creeks, and rivers, from New Brunswick to Georgia. A naturalist says: "It inhabits stagnant ponds or lakes, and is never found in rivers or running streams." This is an error. I have seen it and seen it captured in the Delaware and Schuylkill rivers, and also in various creeks of running water.

In Pennsylvania, April is the month in which it generally awakens from its winter nap, and quits its dark dormitory of mud to enjoy the spring sunshine. It may sometimes be seen floating on the surface of the water, with legs extended, and its head just partly drawn within its shell, but sinks quickly at your near approach.

It is generally supposed that turtles do not have a note or song, or produce any sound except a hiss, given when the head is suddenly drawn back within the carapace. But the painted turtle has a love song which he often sings during May. It is something like the shrill note of the toad, but cannot well be described. About the first of June the female quits the water and digs a hole in the ground, in which she deposits her eggs. They then appear to receive no more attention, but are hatched by the temperature of the soil. The young turtles make for the water as soon as hatched. They are truly pretty little things: indeed I may call them "real 'cute."

I cannot say what this turtle principally feeds upon in a wild state, but in captivity it devours meat, fish, tadpoles, earthworms, and also berries.

The painted turtle, though not considered eatable, is nevertheless sold along with several other turtles, and figures as a "diamond-back" in the famous terrapin supper. Indeed in some seasons there are more wood turtles (*Chelopus insculptus*, Le Conte) and red-bellied turtles (*Pseudemys rugosa*, Shaw) sold in the Philadelphia markets than edible salt water terrapins or diamond-backs (*Malacoclemmys palustris*, Gmel., Gray) The game dealers call the female turtles "cows," and ask higher prices for them than the "bulls," as they are generally fatter, and often contain eggs. I examined a netful of terrapins at a game store a week or two ago, and found them all to be of the *rugosa* species. Many of them were dead, and two were so "*very* dead" that their eyes had dried up and sunk deeply into their sockets. And yet the wily caterer will buy them and stew them with wine and spices, and the epicure will smack his lips over this reptilian carrion, and exclaim, "How delicious!"



THE PAINTED TURTLE.

The painted turtle may be recognized by its smooth carapace, the large plates of which are dark olive or greenish black, margined with yellow, and the marginal plates with internally red markings. The plastron (under shell) is of a bright yellow color; sometimes, though rarely, it has a few dark spots. The head is black, with two or more spots on the sides; the neck marked with yellow lines. The legs are streaked with red and black. When full grown it measures from six to eight inches.

The Education of Wild Beasts.

The veteran animal tamer, Alfred Still, says that too much whipping makes a wild animal sulky and vicious, but a certain amount of whipping is necessary. To train a wild beast, he said recently, you must "first make its acquaintance from the outside of the cage, and get the animal acquainted with your face; but, above all, with your voice. They become accustomed to voices sooner than faces, and are governed more by sound than by sight. Having got accustomed to your beasts, and they accustomed to you, your next step is to train them to their tricks. Though these tricks are simple, they require a great deal of time and patience and a good deal of whipping to accomplish them. The lions are the smartest of the wild beasts. You can train a lion to do the ordinary tricks of the trade: jumping through hoops and over gates, standing on his hind legs, and so on—in about five weeks' constant work. It will require about a week longer to teach a lioness, and a leopard, which comes next to a lion in intelligence, about six weeks to learn the same feats. It takes about seven or eight weeks to teach a tiger, and a tigress from eight to nine weeks, while you can keep on beating and teaching a hyena for four months before you can do much with him. The most difficult thing to do is to teach a wild beast to let you lie down on him without his trying to make you lie *in* him by eating you up. Kindness—that is, anything but ordinary civility—is absolutely thrown away upon a wild beast. With a tiger or tigress especially all affection is literally wasted. A tigress is as likely to eat you up after an intimate acquaintance of six years as one of six weeks. As a rule, the whip is the most efficacious instrument for training. It can be used quickly and it hurts. If I were to drop my whip the beasts would fancy I had lost all my power over them and would pounce first on the whip and then go for me. The four tigresses trained in that cage are estimated to be worth $32,000; but a good tiger, unbroken, is not worth more than $2,500. Lions are worth about $2,000 to $2,500 each; panthers, $600; jaguars, $400; hyenas, $250, if untrained; leopards, $250 to $400, according to their kind."

Wild Pigeons in Michigan.

A correspondent of the Detroit *Post*, writing from Traverse, Mich., April 24, says that the biennial flight of pigeons to the woods of Northern Michigan began the latter part of March. These birds on their journeyings from the South to the far North stop every two years for two or three nestings in Michigan, usually coming in immense numbers. On the alternate years, when beech nuts are not abundant in this State, they take some other course in their northward flight. Formerly their first nesting was in Allegan or Ottawa county. Of late they have generally settled first in Shelby, Oceana county, and later in the season in Benzie and Emmet counties. Two years ago they skipped both Oceana and Benzie counties and nested first in Emmet, near Petoskey. This year their first flight was to the same section, but they soon discovered that they had been fooled by the warm weather further south. The weather about Petoskey was still cold, the bay was frozen over, the snow was deep in the woods, the prospect for good feeding was bad, and after a day or two of apparent irresolution and many erratic flights the birds, as if by common consent, took their course to the neighborhood of Platte River in Benzie county. As a local publication stated at the time, "they came in clouds, millions upon millions. It seemed as if the entire world of pigeons was concentrating at this point. The air was full of them and the sun shut out of sight, and still they came, millions upon millions more." They spread over an area of more than fifteen miles in length and six to eight miles wide, and the prospect for a time was

that the nesting would be the most extensive ever known in the State. The news speedily reached all parts of the State, and it is said that in a fortnight's time three thousand hunters—professionals, amateurs, greenhorns—had invaded the country from all directions, surrounding and penetrating the nesting grounds.

It was noticed, however, by old hunters that the birds did not settle down to domestic life as quickly as usual. The roosting birds—that is, those who had not yet mated—outnumbered the nesting birds a hundred to one. Some of the more zealous and inconsiderate sportsmen entered the nesting woods and commenced popping away at the nests themselves, a snow storm followed, high winds prevailed, and many of the roosting birds, disgusted, postponed their anticipated housekeeping, and scattered. The nesting consequently falls far short in magnitude of what was at first expected, though still large in area and containing millions of birds. It scattered along the banks of the Platte River, the townships of Almira, Zeeland, and Homestead. The distance from one end to the other is over ten miles, and the width varies from a few rods to three or four miles. There are, however, numerous long distances between the two extremes where no nests are to be found, and the birds have occasionally changed their ground, so that many of the hunters themselves are very uncertain as to the exact whereabouts of the birds at the present time. In the nests first made the young are about ready to fly, and have been abandoned by the old birds, and in some places, owing to the winds and the constant shooting, the nests have been deserted before any birds were hatched.

One nesting is about the same as another, and the first nest you come to is like the million others in the county. When these migratory birds have mated, decided where to settle, and have staked off their claim, they proceed at once to construct about the slightest nest that will hold an egg and a bird. "Three sticks and a feather" constitute about the material, according to a recent visitor here. The feather is often wanting, but a few more sticks are generally added. The nest is placed in the crotch of a tree, on two forked branches, or anywhere else in the tree where suitable support can be found. Cedar trees along the river bottoms seem to be preferred, but when the nestings are large, beech and other trees are occupied. From half a dozen to fifty or sixty nests are built in a tree, and only one egg is laid in each nest.

NATURAL HISTORY NOTES.

Interdependence of Plants and Animals.—Few, perhaps, know that a certain little gall fly (*Cynips*) of Asia Minor decides on the existence of tens of thousands of human beings. As our clippers and steamers carry the produce of the land from continent to continent, so these tiny sailors of the air carry the fertilizing pollen from the male to the female flowers of the fig tree. Without pollen there come no figs, and consequently on the activity and number of the gnats depends the productiveness of these trees. The fruit of the fig is not, as in most other cases, a pericarp enveloping the seed, but a common calyx or receptacle which incloses the flowers. In the center of this receptacle the cavity is lined with a multitude of flowers, the male and female blossoms being on distinct plants. The medium of communication to these flowers is only a small aperture at the summit of the receptacle. Hence the access of pollen to the female blossoms is impossible by the ordinary means of transmission, and this is accomplished by the little gnat, which is continually fluttering about from fig to fig for the purpose of finding a suitable place in the cavity to deposit its eggs. These gnats, therefore, regulate in fact the extensive and profitable fig trade of Smyrna. A little ugly beetle of Kamschatka has, in a like manner, more than once saved the entire population of the most barren part of Greenland from apparently unavoidable starvation. It is a great thief in its way, and a most fastidious gourmand moreover. Nothing will satisfy it on a long winter evening—and we must bear in mind that these evenings sometimes last five months without interruption—but a constant supply of lily bulbs. The lilies are well content with this arrangement, for being eaten comes as natural to them as to a Fiji islander; and they are, as a compensation, saved from being crowded to death in a narrow space, while those that escape the beetle shoot up vigorously the next summer in rich pastures. Still better content are the Greenlanders; for, when their last mouthful of meat and their last drop of train oil are gone, they dig up and rob the provident little beetle of its carefully hoarded treasures, and, by its aid, manage to live until another season.

Self Defence among Plants.—Dr. Beccari describes an epiphytal plant, a *myrmecodia*, growing on trees in Borneo. Its seeds germinate, like those of the mistletoe, on the branches of the tree; and the seedling stem, covered by the cotyledons, grows to about an inch in length, remaining in that condition until a certain species of ant bites a hole in the stem, which then produces a morbid gall-like growth, which ultimately becomes a tuber-like body, constituting the home of the ants. Dr. Beccari asserts that the presence of these ants is an essential to the plant's existence, for unless the young plants are thus attacked by these insects they soon perish. The ants then protect their plant home by rushing fiercely out on the intruders. The white sessile flowers in this species are produced on the tuber-shaped body of the plant.

Dispersion of Seeds.—Says Professor Prentl, in a recent lecture on the means taken by plants to disperse their seeds: "Seeds that have not learned to fly with their own or other people's wings, are taught, it seems, to swim. Trees and bushes which bear nuts love low grounds and river banks. Why? Because their fruit is shaped like a small boat, and the rivulets playing over silvery sands, as well as the broad waves of the Pacific, carry their seed alike safely and swiftly to new homes. Rivers float down the fruits of mountain regions, into deep valleys and to far off coasts, and the Gulf Stream of our own Atlantic carries annually the rich products of the torrid zone of America to the distant shores of Iceland and Norway. Seeds of plants growing in Jamaica and Cuba have been gathered in the quiet coves of the Hebrides. The fruit of the red bay has the form of a piroque; at first it sinks to the bottom, but nature has given it a small hole in the upper part; a little air bubble forms there, and causes it to rise again. The gigantic sea cocoa itself, weighing not rarely more than five pounds, but air-tight in its close shell, and buoyant by reason of its light, fibrous coat, is thus drifted from island to island, and rides safely on the surges of the ocean from the Seychelles to the distant coast of Malabar. There it lodges and germinates in the light moist sand, so that the Indians of old fancied that these fruits grew under water, and called them "sea cocoas." A still more striking provision of nature is this, that there are some seeds of this kind so exquisitely adjusted to their future destination, as to sink in salt water, while they swim with safety in fresh water."

The Pedigree of the Dog.

While considering the problem of the origin of the dog, in a recent lecture at the Royal Institute, in London, Prof. Huxley expressed the opinion that its solution was easy if a beginning was made upon a solid basis of fact. Such a basis of fact was supplied by what was known of the origin of dogs in North America. The Indians of the northwestern parts of America were all in possession of half-tame cur-like dogs, living in the same way as the dogs in Egypt—in a semi-independent condition. In the same country there existed a wild animal—the *Canis latrans*, or prairie wolf. It was impossible to point out any distinction between these prairie wolves and the domesticated dog of the Indians. It was somewhat difficult to understand how these wild and fierce animals could be tamed; and yet, when one knew their habits, it was easy enough. The smaller wolves and jackals, although predacious and fierce, were endowed with singular curiosity; that curiosity directed them toward man and his doings. There was not one of these animals which, if caught young—whether jackal or small wolf—could not be tamed and made as attached and devoted to man as any ordinary dog. It was not difficult to understand, therefore, how these animals became acquainted with man, how they became trained, and how from them sprang a race of domesticated animals which, curiously enough, were far more attached to their masters and the animals with which they were brought up than to members of their own family. If they could depend upon the fact that this one domestic dog originated in the taming of an indigenous wild animal, then the general problem of the origin of domestic dogs would take this form—could they find in all parts of the world in which domestic dogs were known wild stock so similar to the existing race of dogs that there was nothing unnatural in supposing that they had the same origin as the Indian dogs? They might trace dog-like animals further and further west, until, in Northern Africa, they had a whole series of kinds of dog-like animals, usually known as jackals. He believed that these wild stocks were the source from which, in each case, the savages who originally began to tame dogs had derived the stock. This view was confirmed by archæological researches. They had preserved to them, on the monuments of ancient Egypt, a great variety of forms of dogs, and it was significant that the further back they went the fewer were the varieties, until, at the time of the third and fourth dynasties—that is about 6,000 years ago—there were only two well marked forms of dogs. One of them was a comparatively small cur-like dog, similar to that which was to be seen in the streets of Cairo at the present day, and the other was like a greyhound. The cur was, no doubt, a tame species of the wild jackal, which was still to be found in the same country; and with respect to the greyhound, there was in Abyssinia a very long-headed dog, which was very much of the same form as the greyhound, and which, it could hardly be doubted, was the source from which it sprang. Assuming that there was no doubt that the origin of dogs could be traced to these sources, the more modified forms of the domestic animal were simply the result of the selected breeding, which had given rise to the same modification in dogs as it had done in the case of pigeons.

Apple Borer.

A subscriber asks how he can get rid of the apple borer. According to a writer on horticultural and agricultural subjects, when borers have once gained possession of a tree the only way to get rid of them is to hunt for them carefully with a knife or wire and destroy them. The eggs of the parent beetle are deposited during nights in June, and are placed in the bark of the tree at the surface of the ground, or whatever may surround the tree. These eggs hatch in our latitude during September; and it is soon after this that the young grub may be easily removed without the use of anything more than the point of a penknife. A few minutes spent in this way about the first of October each fall will keep the tree from this pest.

RECENT DECISIONS RELATING TO PATENTS, COPYRIGHTS, ETC.

Supreme Court of the United States.

BAKER *vs.* SELDEN.

(*Decided October Term*, 1879.)

1. The copyright of a book, if not pirated from other works, will be valid without regard to the novelty of the subject matter.

2. The description of an art in a book entitled to the benefit of copyright lays no foundation for an exclusive claim to the art itself. The description alone can be protected by copyright. The art can only be secured, if it can be secured at all, by letters patent.

3. A work on the subject of book-keeping, explanatory either of old systems or of an entirely new system, considered as a book conveying information on the subject and containing detailed explanations of the art, is the subject of copyright; but the use of the peculiar systems of book-keeping described cannot be protected thereby.

4. Blank account books with ruled lines and headings are not the subject of copyright, nor can the copyright of a work on book-keeping with portions illustrated by such ruled lines and headings secure the exclusive right to make, sell, and use account books prepared upon the plan set forth in such book.

5. Although the proofs show that the defendant makes account books arranged on substantially the same system as that explained in the copyrighted book of the plaintiff, it does not appear that he has violated the copyright of the same regarded merely as an explanatory work, and, as the plaintiff is not entitled to an exclusive right in the system, the charge of infringement is not sustained.

Appeal from the Circuit Court of the United States for the Southern District of Ohio.

Mr. Justice Bradley delivered the opinion of the Court.

Among other things stated is the following:

The remarks of Mr. Justice Thompson in the Circuit Court in the case of Clayton *vs.* Stone & Hall (2 Paine's Rep. 392), in which copyright was claimed in a daily price-current, are apposite and instructive. He says:

In determining the true construction to be given to the act of Congress it is proper to look at the Constitution of the United States to aid us in ascertaining the nature of the property intended to be protected. "Congress shall have power to promote the progress of science and useful arts by securing for limited times to authors and inventors the exclusive right to their writings and discoveries." The act in question was passed in execution of the power here given, and the object, therefore, was the promotion of science; and it would certainly be a pretty extraordinary view of the sciences to consider a daily or weekly publication of the state of the market as falling within any class of them. They are of a more fixed, permanent, and durable character. The term "science" cannot, with any propriety, be applied to a work of so fluctuating and fugitive a form as that of a newspaper or price-current, the subject matter of which is daily changing and is of mere temporary use. Although great praise may be due to the plaintiffs for their industry and enterprise in publishing this paper, yet the law does not contemplate their being rewarded in this way; it must seek patronage and protection from its utility to the public, and not as a work of science. The title of the act of Congress is "for the encouragement of learning," and was not intended for the encouragement of mere industry unconnected with learning and the sciences. . . . We are accordingly of opinion that the paper in question is not a book the copyright to which can be secured under the act of Congress.

The case of Cobbett *vs.* Woodward (L. R., 14 Equity Cases, 407) was a claim to copyright in a catalogue of furniture which the publisher had on sale in his establishment, illustrated with many drawings of furniture and decorations. The defendants, being dealers in the same business, published a similar book, and copied many of the plaintiff's drawings, though it was shown that they had for sale the articles represented thereby. The court held that these drawings were not subjects of copyright. Lord Romilly, M. R., said:

This is a mere advertisement for the sale of particular articles which any one might imitate, and any one might advertise for sale. If a man, not being a vendor of any of the articles in question, were to publish a work for the purpose of informing the public of what was the most convenient species of articles for household furniture, or the most graceful species of decorations for articles of home furniture, what they ought to cost, and where they might be bought, and were to illustrate his work with designs of each article he described—such a work as this could not be pirated with impunity, and the attempt to do so would be stopped by the injunction of the Court of Chancery; yet, if it were done with no such object, but solely for the purpose of advertising particular articles for sale, and promoting the private trade of the publisher by the sale of articles which any other person might sell as well as the first advertiser, and if in fact it contained little more than an illustrated inventory of the contents of a warehouse, I know of no law which, while it would not prevent the second advertiser from selling the same articles, would prevent him from using the same advertisement, provided he did not in such advertisement by any device suggest that he was selling the works and designs of the first advertiser.

Another case, that of Page *vs.* Wisden (20 *Law Times* Rep., N. S., 435), which came before Vice-Chancellor Malins

in 1869, has some resemblance to the present. There a copyright was claimed in a cricket scoring sheet, and the Vice-Chancellor held that it was not a fit subject for copyright, partly because it was not new, but also because "to say that a particular mode of ruling a book constituted an object for a copyright is absurd."

The decree of the Circuit Court must be reversed, and the cause remanded, with instructions to dismiss the complainant's bill.

WOODBURY PATENT PLANING MACHINE COMPANY *vs.* KEITH.
(*Decided October Term*, 1879.)

1. Woodbury filed a caveat May 28, 1846, and his application June 3, 1848. The latter was rejected February 20, 1849, and the fee withdrawn in October, 1852. Under the act of 1870 the application was renewed within the six months allowed, and the patent granted April 29, 1873. No serious attempt having been made to procure a re-examination of the old application, or to renew it, for a period of more than twenty years, though during more than sixteen years of that time the improved device had been in common use with the knowledge of the patentee, it was held that the invention was abandoned before the renewed application was made.

2. The action of the Commissioner of Patents in granting a patent, under section 35 of the act of 1870, is not conclusive on the question of abandonment.

3. The rule of the Patent Office prior to the passage of the act of 1870, that an application rejected, or not prosecuted within two years after its rejection or withdrawal, should be conclusively presumed to have been abandoned, though not always adhered to, had held it to be a question of law in the cases to which it applied, and the effect of the statute was rather to change the rule than to make the decision of the Commissioner granting a patent an unreviewable decision that the invention had not been abandoned.

4. Section 35 of the act of 1870 declares abandonment to be a question of fact, and patents granted thereunder are just as impeachable as those granted under section 24, whereby the Commissioner is authorized to deal with the question of abandonment as well as public use and sale and originality of invention.

5. Abandonment, although a matter of intention on the part of the inventor, need not be expressed in words, but may be gathered from the acts of the inventor.

6. Abandonment may occur as well after an application has been made and rejected or withdrawn as before, and evidenced in the same manner.

7. The law requires and favors diligence in prosecuting the claims to an exclusive right, and an inventor cannot, *without cause*, hold his application pending during a long period of years, leaving the public uncertain whether he intends ever to prosecute it, and keeping the field of his invention closed against other inventors.

8. Circumstances may arise which will excuse delay in prosecuting an application, such as extreme poverty or protracted sickness; but in the absence of any such excuse entire inaction on the part of the inventor, coupled with long-continued public use without complaint or remonstrance on his part, constitute abandonment to the public.

9. The rule of the Patent Office that an application rejected, or not prosecuted within two years after its rejection or withdrawal, should be conclusively presumed to have been abandoned, was not a statutory rule, nor inflexible in its application, but was frequently departed from and abolished before the act of 1870, and was no bar to a movement on the applicant's part to have his application reinstated after withdrawal, or to have it re-examined, or take an appeal, or file a new one, and cannot be regarded as an adequate excuse for a long delay.

10. Woodbury's invention, patented April 29, 1873, was anticipated by the machine made by Alfred Anson in 1843, and in constant use for thirty years.

11. Mere enlargement of a machine to strengthen or increase its capacity is the work of the mechanic and not invention.

12. An objection to the examination of a witness should state specifically the grounds of the objection, in order that the opposite party may have the opportunity of removing it, if possible.

13. Under section 4920 of the Revised Statutes only the names and residences of those who had invented or used the anticipating machine or improvement, and not the names of those who are to testify of its invention or use, are required to be pleaded.

Bill dismissed with costs.

The Sense of Space.

At a recent meeting of the French Society of Biology M. Mathias Duval reported what he believed to be an important discovery in relation to the origin of the auditory nerve. He finds, in the course of his researches upon the origin of the cranial nerves, that the auditory nerve has two quite distinct roots, the posterior one proceeding from a nucleus, described by all authors, the other, anterior, proceeding from a nucleus for motor fibers. Some fibers of the anterior root turn back into the cerebellum. Now, we know that the cerebellum is the center for the co-ordination of movements. In associating this anatomical fact with the physiological researches of M. De Cyon, upon the sense of space, and with some pathological facts, tending to prove that vertigo has for a cause a lesion of the semicircular canals, M. Duval concludes that the anterior root of the auditory nerve forms the *nerve of space*, of which the semicircular canals are the peripheric organs.

Minneapolis Flouring Mills.

The pride of Minneapolis, and one of the principal factors in the wonderful growth and prosperity of our city, are the unrivaled and matchless flouring mills which line the bank of the Mississippi River at the Falls of St. Anthony, and whose unequaled products have already given to Minneapolis flour a world-wide reputation. Twenty-four of these splendid mills, which stand as monuments of Minneapolis courage and enterprise, have already been erected, and others, still more extensive and imposing, are to follow at an early day. Among the most prominent of those already constructed are the great Washburn A and B, and the Crown Roller mills. The Washburn "A," standing on the site of the one destroyed by the explosion of May 2, 1878, is 100x244 feet, is nine stories high, and will, by the adoption of newly invented machinery, have a capacity of 3,000 barrels daily. The Crown Roller Mill, now nearly completed, has a ground surface of 124x144 feet, is eight stories high, and, using the most improved styles of machinery, will be able to turn out 2,500 barrels daily. Both of them are to be illuminated with the newly invented electric lights, and are, in all respects, the largest and most complete flouring mills in the world. The highest grades of flour are made at these 24 mills, which is eagerly sought for in the markets of the world. The entire daily products of these mills, when fully completed and running, will reach the enormous amount of 17,500 barrels every 24 hours, and requiring, if the mills be run 300 days in the year, not less than 25,000,000 bushels of wheat for their use alone, or far more than one-half the entire present wheat production of the State.

The effect of this constant demand upon the crop of our State is already well understood by all intelligent business men and farmers, steadily maintaining as it does the price of wheat from 5 to 10 cents per bushel above what it would be if left to be governed alone by the Milwaukee, Chicago, and Eastern markets. The average price received by the farmers of Minnesota for their wheat during the years '77, '78, and '79, by reason of the local market of Minneapolis, is not less than 7 cents per bushel on the crops named more than they would have received if left to the control of the Milwaukee and Chicago markets, or in the aggregate not less than $7,000,000 has actually been added to the pockets of the wheat-growers of our State by the existence and operations of the Minneapolis millers. This vast sum of money has not only been received by the farmers to add to their comforts and conveniences of life, but has gone through their hands to swell the great volume of trade which has built up our towns and commercial centers. This fact alone, now so well understood by the wheat-growers of Minnesota, is a complete and conclusive answer to charges of political knaves and demagogues who occasionally seek, during election campaigns, to represent the Minneapolis millers as the natural enemy and scourge of the wheat-growers of our State. The growth and development of the milling interests of Minneapolis are strikingly shown by the following list of shipments for the years named:

Year.	Barrels.
1860	30,000
1865	98,000
1870	193,814
1873	583,009
1874	727,157
1875	843,769
1876	1,000,676
1877	935,544
1878	940,876
1879, estimated in part	1,500,000

In explanation of the diminished shipments in 1877 and 1878, we would state that in 1877 there was an almost entire failure of the wheat crop in a large territory from which the mills drew their supplies; and in May, 1878, over two-fifths of the milling capacity was destroyed by fire, and in November another twelve-run mill shared the same fate.

Before dismissing this subject it may be of interest to the general reader to know that, in Minneapolis, the so-called "patent process," by which the highest grade of flour is produced, was first developed, and to show its advantage to the State at large, it is only needful to add that before the new process was developed, spring wheat—the only kind successfully cultivated here—sold for an average of twenty-five cents a bushel below the price of winter wheat. To-day, by the "patent process," the price of spring wheat, such as our farmers raise, is worth more than winter wheat, for the reason that the "patent process" can be applied only to this kind of wheat, and the product leads the price in the flour markets of the country.

The future of this great interest of our young city it is hardly possible to imagine. As yet it is but in its infancy, and already has its firm grasp upon the markets of the world. How rapidly it is extending itself will be seen by the following facts:

In 1875 Mr. George H. Christian went abroad with the view of studying foreign milling processes, and introducing, if possible, Minneapolis flour upon the European market. Mr. Christian learned much of foreign milling, but met little success as to the other part of his mission. For two years following, the quality of our wheat was such as to render it difficult to keep the grade of our flour up to a satisfactory standard, and no effort was made to cultivate a foreign market. In the spring of 1877, Mr. L. Christian went abroad to follow still further the previous investigations of his brother G. H., and to study more closely the flour trade of the leading cities of the Old World, and on his return Mr. W. H. Dunwoody went out to still further study the question of direct trade between the Minneapolis manufacturers and the leading flour houses in England and Scotland. The result of these various missions was that foreign dealers became better informed as to the character of our flour and the advantages of introducing it to their customers, and in 1878 a small direct export trade confined mainly to "bakers'" and low grades was established. Later on, small samples of the "fancy" were ordered for Liverpool, London, and Glasgow, and the trade once inaugurated increased rapidly until it had thus early grown into considerable magnitude, and not less than 450,000 barrels, or their equivalent in sacks, have been shipped during 1879 direct from the mills in Minneapolis to leading points in the United Kingdom, France, Germany, Spain, and Italy, while direct shipments have also been made to Alexandria, Egypt. To-day there is not a port in Europe to which through bills of lading cannot be obtained in Minneapolis at fixed rates.

English millers and dealers who have visited our great mills during 1879 have frankly stated that in their opinion the fine grades of Minneapolis spring wheat flour are destined to supplant the products of the Hungarian mills which have controlled the English market for so many years. The trade thus sought to be established amounted in 1878 to but $763,281, but in 1879 had increased to $3,150,000. What that trade will amount to in the future can be predicted only from its wonderful triumphs in the past.—*Pioneer Press.*

The Paris Abattoir.

The slaughter houses of Paris are located at La Villette, on the outskirts of the city, and form, together with a police station, telegraph office, barracks for a small force of troops stationed there, and other buildings, a town of very respectable size. The buildings, which are of stone, were constructed in the most thorough manner by the city under government authority. The premises are inclosed by a high stone wall, and the grounds are divided into regular rectangles by four avenues, intersected by four streets.

Through each building runs a series of cours, covered with a glass ceiling, and in these cours the slaughtering is done, the animals being dressed on wooden frames placed at regular intervals on each side of the cour. A peculiar feature of the business is that of blowing up the carcass as soon as the head and legs are cut off, which the *Commercial Bulletin* describes as follows: The body being placed on the dressing frame, an incision is made in the breast near the neck, and the nozzle of a bellows inserted. A man then works the bellows for about fifteen minutes, until the whole carcass is swollen out like a small balloon. The reasons given for this are that it makes the meat look better, more plump than it otherwise would, and that it enables the one who skins the carcass to get the hide off quicker and easier, without injuring it. All bullocks, calves, sheep, etc., slaughtered in these establishments are blown up in this manner.

Pig butchery in Paris is also conducted upon a novel plan. The pigs are taken into a large round house, having a cupola in the roof to let off the smoke, the floor being divided into triangular dens. A dozen or so of pigs are driven into each den at a time, and a butcher passes along and strikes each one on the head with a mallet.

After being bled, the defunct porkers are carried to the side of the room and arranged methodically in a row. They are then covered with straw, which is set on fire and the short bristles quickly burned off. After a thorough scorching the pigs are carried into the dressing room, hung up on hooks, and scraped by means of a sort of drawing knife, handled by a skillful operator, who performs his work at the rate of about one pig a minute. Then the bodies are washed and the entrails taken out and cleaned.

Every part of the animal is utilized in Paris, and that which the American throws away as worthless is made to subserve some use in the Frenchman's economy. The pig's blood is used in the manufacture of the large black sausages which meet with such extensive sale in Paris. The long bristles are pulled out by hand and go to the brush maker.

Regenerating the Potato.

The well known writer, Mayne Reid, has been experimenting with Mexican seed potatoes in Herefordshire, England, thereby doubling his crop and entirely escaping the blight which has been so fatal to the English and Irish potato crop of late years. He says, in a letter to the London *Live Stock Journal*, that for the last three years he has been cultivating seed which came direct from Mexico, with the result, that while ten other sorts, planted in the same field, tended with like care—in short, *cæteris paribus*—have all been more or less diseased, his Mexican "papas" show not a spot of blight. Nor is this all in their favor, for while the best of the other kinds have yielded less than five tons to the acre, they have produced over ten, in common drills done by the plow. Hundreds of specimens were above one pound in weight, some even a pound and a half.

After being stored in ordinary field pits through the winter the Mexican potatoes come out perfectly sound, and seem to improve in quality as the spring advances. As an article for the table he thinks they have no superior; and he proposes that his government take in hand the importation of Mexican and Peruvian seed as a cure for the potato blight.

Bonesilate.

A new material, called bonesilate, has been added to the manufactured products of Newark, N. J. Its basis is bone dust. It can be polished and colored, and is harder than celluloid. It is used for buttons, door knobs, billiard balls, and other articles now made of ivory and hard rubber.

NEW INVENTIONS.

A machine for giving to railway and other spikes a uniform twist from the head to the point has been patented by Silas H. Wilson, of Auburn, N. Y. The invention comprehends an improved combination of rotary jaws, reciprocating die wheels, and feeding mechanism. It consists also of grooved rollers journaled in a carriage which is adapted to move toward and from the rotary jaws, which receive the spike, carry it to the jaws, and hold it against rotating while the jaws are twisting it, the lower grooved roll having also a vertical movement to allow the spike to pass between it and the upper roll, and to enable it to release the spike after the twist is put in it.

Mr. George W. Dudley, of Waynesborough, Va., has patented a novel saw filing and setting machine designed especially for saws having a straight row of teeth, and it comprises features of improvement as follows: A peculiar construction and arrangement of devices for imparting an elastic cutting stroke to the file; means for raising the file on the back stroke; a peculiar construction of guide for holding outer end of file frame against lateral displacement and determining the depth of cut; means for shifting angular position of saw to give alternate incline to the edge of teeth; clamping and holding devices for the saw; means for adjusting the saw to an angular or straight position; means for locking and holding the saw in position; a peculiar construction and arrangement of the saw-set; also a double adjustment of the wrist pin connecting with the file-driving pitman to adapt the device to longer or shorter files.

Mr. Charles H. Horton, of Brighton, O., has patented an improved apparatus for automatically weighing or measuring grain and registering the operation. The grain is received in a rocking box or receiver having two compartments that are alternately filled and emptied, the weight of the grain acting to shift the box as required. The box is hung on a scale beam having an adjustable weight, whereby the quantity discharged at each alternation is regulated, and the movement of the receiver gives motion to registering mechanism, so that the oscillations are recorded.

Mr. Stephen S. Wood, of New York city, has patented improvements in sand distributers for horse-cars to apply sand to the rails to prevent the wheels from sliding when the brakes are applied. The invention consists in the combination, with the frame-work of a car and with hoppers attached to the frame-work, of a mechanism by which sand may be discharged upon the rails.

Mr. Andrew T. Jackson, of Cotton's Store, Ala., has patented an improved chimney flue and shield, designed to prevent leakage around stove-pipes when they pass directly through the roof of a building and to avoid the use of horizontal lengths in such pipes. The invention consists in a conical shield and pipe secured upon a plate that is fixed to the roof, and combined with a weather cap and the stove pipe in a manner to exclude rain from the inner side of the roof, and to obtain other advantages.

An adjustable pattern for cutting out boot and shoe soles of any dimensions has been patented by Messrs. John P. Simon and Jacob Lex, of Hartford, Wis. It consists of a metal plate of the general shape of the sole and provided on its upper face with short studs, upon which studs are fitted slotted metal plates shaped to conform, respectively, with the outlines of the sides, heel, and toe of the sole, the adjustable plates being also held together by slots and studs, so that they may be moved in or out to contract or expand said pattern in proper proportion in every direction.

Mr. Mark A. Dees, of Scranton, Miss., has patented an adjustable frame adapted to support a lamp and brush in combination with the treadle, rods, and operating levers.

Mr. John J. Gordon, of Flint, Mich., has patented an improvement in butt-hinges, designed to facilitate the fitting of the hinge in place; and it consists in constructing the hinge with leaves of different widths and forming on the narrower leaf a flange, by which construction the shape and depth of the mortise into which the hinge is fitted may be laid off and the use of the square dispensed with.

A series of mirrors have been supported upon one or more standards and grouped or arranged in such a manner that a figure seen in one of them would be seen in all the others. Mr. Joseph P. Short, of Dodgeville, Wis., has patented an invention which is an improvement in this line. It consists in the combination and arrangement of four mirrors, suitably secured in a frame, so that front and back views of the same figure will appear in opposite mirrors.

An improved railway car for transporting live stock, more especially horned cattle, has been patented by Mr. William Martin, of San Francisco, Cal. The improvement relates to swinging stanchions or guards for securing the cattle.

An improvement in hydraulic ram motors has been patented by Mr. James Thomas, of Catasauqua, Pa. The object of this invention is to furnish hydraulic rams so constructed that they may be used to deliver power. The invention consists in the combination of a secondary piston and cylinder with the water chamber of the ram.

Mr. Anton Zimmerer, of Nebraska City, Neb., has patented an improvement in that class of knives that are designed for cutting hay, straw, fodder, etc., in bundles or stacks. The invention consists of a series of revolving or stationary circular cutters inserted along the cutting edge of a suitable blade, bar, or frame.

A novel steam generator for heating and dampening wheat in flour mills, for steaming feed for farm purposes, etc., has been patented by Mr. Oscar Van Tassell, of Parkersburg, Iowa.

Mr. Henry Hickman, of Omaha, Neb., has patented a collar button that will hold the necktie and prevent it from slipping. The invention consists of a collar button provided with one or more points at the end of the shank, which pass into the necktie and hold it in place. It also consists in providing the shank with an adjustable screw head, which can be set to cover the points so that they do not catch in the clothing.

An improved hat press has been patented by Mr. M. A. Cuming, of New York city. The object of this invention is to improve the construction of the hat presses for which letters patent Nos. 167,506, and 178,740 were granted to the same inventor September 7, 1875, and June 13, 1876, respectively, the object being to make them more satisfactory in use and more effective in operation.

Mr. Tristram W. Blades, of Point Pleasant, W. Va., has patented an improvement in guide boards or indicators, which consist in a certain construction and arrangement of parts, which cannot be clearly described without an engraving.

Mr. Jacob Huy, of Whistler, Ala., has patented an improvement in the class of cars for transporting live stock which have a second floor or deck, that is vertically adjustable, and racks and troughs suitably arranged for supplying food and water to the animals on one or both floors. Four different kinds of animals can be loaded in this car, and each kind or lot may be kept separate from the rest, and each can be fed separately and conveniently with the food suitable to its taste and requirements. After the animals have been unloaded the car can be quickly made ready to be loaded for a return trip. To do this the deck or false floor is raised and secured beneath the roof of the car.

Mr. Charles E. Glazier, of Hornellsville, N. Y., has patented an improved spray nozzle for hose and other water pipes, which consists in a certain novel construction and arrangement of devices for breaking up the stream of water and converting it to spray without back pressure on the column.

An improvement in India-rubber and other gum compounds for surfacing cloth and for other purposes has been patented by Mr. Charles Y. Beach, of Fairfield, Conn. This invention has for its object to overcome the objectionable odor commonly present in goods that are made wholly or partly of rubber or other gum compounds. The invention relates to the preparation of the gum compounds for general use in the arts; but the principal application of the discovery is in surfacing cloth and other fabrics with rubber or other gum compounds.

An improved tether has been patented by Mr. Eugene H. Angell, of Mooers, N. Y. The object of this invention is to furnish combined tethers and tackles, so constructed that when arranged as a tether the slack of the rope will be taken up to prevent the animal from becoming entangled in it, which will prevent the tethered animals from being injured by a sudden pull or jerk upon the rope, and which will allow the tackle to be detached from the tether and used as an ordinary tackle.

Mr. Fortonato C. Zanetti, of Bryan, Texas, has patented an improved game apparatus. The invention consists in a series of tilting levers arranged at the end of an alley and hinged to a rod resting on two standards connected by check-rods, against which the ends of the tilting levers rest in their several positions. The tilting levers are provided with numbered plates and with bells, which ring when a lever has been struck by a ball and tilts.

Mr. Henry Lefort, of Newark, N. J., has patented a new and improved watch crown, which can be easily held and adjusted in the pendant and is simple in construction. It consists in a spring bushing loosely mounted on a flanged sleeve adjustable on the pin of a watch crown, whereby the crown is held in the pendant by the pressure of the spring bushing against the sides of the pendant.

Mr. Gustav F. Sievern, of Brooklyn, N. Y., has patented an improvement in holders for window clothes-lines so constructed that the clothes may be placed upon and removed from the lines without its being necessary for the operators to lean out of the window.

Mr. William C. Culbertson, of Girard, Pa., has patented an improved iron fence post, so constructed that it may be easily set up, taken down, and removed from place to place. It is strong, firm, and durable.

Mr. Laning L. Ferris, of New York city, has patented an improved bill and letter file which will permit inspection or removal of the papers upon it and may be used for binding the papers together. The invention consists of a plate secured by a set screw to a suitable base and carrying two fixed and two removable arms or wires which curve inward, the point of the fixed wires overlapping the points of the removable wires, so that the bills may be inserted between the points and pressed upon either pair of wires. The removable wires are eye-pointed to receive a cord, and may be drawn down through the plate when the latter is removed from its support.

Mr. John Copcutt, of Yonkers, N. Y., has patented an improvement in the construction of the floors, doors, and shutters of buildings. The object of the invention is to prevent the rapid spreading of fire from one part of a burning building to another by burning through those parts.

A felting machine with an adjustable and self-adjusting apron surrounding the felting roll, whereby the machine may readily adapt itself to the bat and the more delicate operations of felting may be performed, has been patented by Mr. John G. Meeker, of Danbury, Conn.

Mr. Norman Allen, of Rockaway Beach, N. Y., has patented a fan containing a number of leaves or sheets adapted to receive advertisements. It is composed of a middle thick sheet of paper, to give stiffness to the fan, and several thinner sheets joined together and provided with a suitable handle.

The Eruption of Colima.

The volcano of Colima, near the Pacific coast, directly west of the City of Mexico, was in active eruption in the foreport of May. The first symptoms of activity were manifested on the first. A dispatch from Mexico, dated May 5, says: The eruption at night is full of splendor and grandeur. Last night lurid flames shot up from the crater of the volcano, illuminating the darkness for miles around. Incandescent stones are also thrown up, together with showers of ashes, which darken the atmosphere in daytime. The fire, smoke, ashes, and stones are accompanied with dreadful subterranean thunderings and frightful and unearthly noises under the volcano, together with quakings of the earth. Inhabitants of villages and towns in the vicinity of the mountain are in a state of panic and wild terror. They are, indeed, in danger in case of a flow of lava.

Colima is 12,000 feet high, and forms the southwestern extremity of a mountain chain traversing Mexico from east to west. Previous to 1869 it was supposed to be extinct.

Studying Puzzles a Waste of Time.

The *Educational Monthly* reflects the sentiments of most thoughtful persons in the following paragraph:

There seems to be, says the writer, a fascination about arithmetical puzzles that leads many persons to waste their time and tire their brains in efforts to solve them. The "13 15 14" puzzle that is now going the rounds is a type of the entire class of puzzles, for it has the following characteristics: 1. The solution can only be found by a tentative process of trial and experiment, and the only tincture of mathematical science which it has is its value as an example in the mathematical doctrine of probabilities. 2. The solution, when it is obtained, does no good, and is utterly devoid of value. It is said that some one gave this puzzle to the great engineer De Lesseps while he was examining the Brooklyn bridge. Great engineers, however, are as likely to fail as other people, and great mathematicians like Isaac Newton and Sir William Rowan Hamilton have no advantage over school boys. If the time spent in deciphering such puzzles were devoted to the study of useful problems, there would be a surprising increase in the sum total of arithmetical knowledge.

Commemorative Medals for Paris Exhibitors.

A dispatch from Paris, dated May 7, announces that the Commission of the Universal Exhibition of 1878 has ordered the striking of 6,800 commemorative medals to be distributed among the members of the foreign commissions, juries, and exhibitors who did not compete for prizes. The medals will be of bronze and will involve an outlay of 300,000 francs. A similar medal will be struck for distribution among the foreign as well as the French journalists who were provided with season tickets to the Exhibition. There still remain 7 gold, 101 silver, and 526 bronze medals, and 2,510 honorable mentions, to be distributed among exhibitors who have not yet asked for them.

To Keep Grain Cargoes from Shifting.

Considerable interest has been manifested in New Orleans with regard to a device patented by a firm in that city to prevent the shifting of grain or any other treacherous cargo. It consists in dividing the ship into longitudinal compartments, secured by rods from side to side of the vessel. These compartments are to be divided longitudinally by sections into any required space that may be desired, in order to effectually separate different kinds of grain, etc., without the use of bagging. The plan is thought to be cheap, simple, and effective.

The Telephone in Paris.

The Edison telephone is in full operation in Paris, the exchange there numbering over 350 subscribers. The carbon transmitter and Phelps receiver are employed. The lines are under the management of the state, and a closed circuit is employed in order to avoid induction currents. Experiments up to distances of 140 miles have been made with success. Trial of the telephone is also being made at the Carberry Mine, near Inveresk, in Scotland.

Prizes for Boys.

The Maine experiment of offering rewards to boys for successful farm work is to be imitated in Vermont. Two of the trustees of the State University have offered $150 in prizes to boys not over seventeen years of age for the best crops of potatoes and corn on one eighth of an acre. The practice is a good one, and might be wisely adopted with benefit to our agricultural interests as well as to boys.

THE PENNSYLVANIA RAILWAY CO.'S ELEVATOR.—The new grain elevator of the Pennsylvania Railroad at Jersey City is rapidly nearing completion. It is 200 feet long, 145 feet wide, and will have a capacity of 1,500,000 bushels. Four "conveyors" will run from the building to the wharf for unloading canal boats and loading ships; and the building will have twenty-four sets of elevating apparatus for taking grain from cars.

Business and Personal.

The Charge for Insertion under this head is One Dollar a line for each insertion: about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

☞ *The publishers of this paper guarantee to advertisers a circulation of not less than 50,000 copies every weekly issue.*

NEW BOOKS AND PUBLICATIONS.

THE MAGAZINE OF ART. Cassell, Petter, Galpin & Co., London and New York. Price 25 cents a number.

A monthly publication containing well executed wood engravings of famous London buildings, bridges, fountains, and street scenes. Every number has illustrations from celebrated paintings, also of remarkable ancient and modern vases. The magazine is well printed and in convenient form for binding.

Notes & Queries

HINTS TO CORRESPONDENTS.

No attention will be paid to communications unless accompanied with the full name and address of the writer.

Names and addresses of correspondents will not be given to inquirers.

We renew our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

Correspondents whose inquiries do not appear after a reasonable time should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them.

Persons desiring special information which is purely of a personal character, and not of general interest, should remit from $1 to $5, according to the subject, as we cannot be expected to spend time and labor to obtain such information without remuneration.

Any numbers of the SCIENTIFIC AMERICAN SUPPLEMENT referred to in these columns may be had at this office. Price 10 cents each.

(1) Z. C. S. asks for a rule for finding the sectional area of a boiler shell. A. By a table of areas, deduct the area of the diameter of the inside of shell from the area of the diameter of the outside of shell, the remainder is the sectional area of shell. Or multiply the thickness of the plate by the average of the circumference of the outside and inside diameters of shell, the product is the sectional area.

(2) A. P. asks: 1. What is the least pressure required to blow off with, the submersion and diameter of blow off pipe being given? A. Disregarding friction, etc., the pressure should be at least one pound for each two feet head of water above mouth of blow-off pipe. 2. What size must a feed pump be, diameter of cylinder being given? A. The size of feed pump is determined by the quantity of water evaporated and not by the size of cylinder. 3. What size of safety valve does a boiler require (grate surface and steam pressure to be carried being given)? A. The rule of the United States steamboat inspectors is one square inch area of valve to each two square feet of grate surface. 3. What lift must a valve of given diameter have? A. One-fourth the diameter of valve. 5. What is the ratio of expansion of wrought iron? A. For each degree of heat (Fahrenheit) 0 00814 of one inch for each 100 feet length.

(3) H. L. S. asks if it is necessary to have an air pump in connection with an engine that exhausts into a keel condenser, said condenser being under the bottom of the boat and consequently always cold and not liable to get hot, pressure of steam 60 to 100 lb., revolutions 75 to 100. The idea of condensing in this manner is to save the fresh water so as to be used in place of salt. A. It is necessary to have an air pump if you wish the benefit of a vacuum, otherwise you can take the water from the condensing pipes with the feed pump.

(4) E. C. N. writes: I have made a dynamo electric machine about five times the size the one that was in the No. 161 SUPPLEMENT with a double coil in the armature, and use only one pair of brushes for my commutator. My machine works well and generates a great deal of electricity. I connect the circuit on the machine with No. 6 copper wire, and take my electricity from the binding posts of the brushes. When running the machine 800 revolutions per minute the machine will fuse 3 copper wires No. 30, 12 inches long, showing that I have great resistance in my machine. I will say right here that I have for field magnets soft cast iron 22 inches wide, 13 inches high, 2 inches thick, wound with 8 layers of double wire No. 14. The armature has one coil, is wound with 3 wires of No. 18, 7 layers; the other with 5 wires No. 18, 7 layers. My commutator is made different from any that I have seen or heard from. My first coil is put on the inside ring, and the wire soldered and the slot cut for neutral points; the other ring is on the same commutator with one-eighth of an inch apart and the slot cut 90 degrees from the others, slot one thirty-second inch. I have but very little sparks at the commutator. I have made a lamp somewhat after the form of Brush lamp, and use Brush carbons, and have a very large light with very small arc, not more than one-sixty-fourth of an inch, but the carbon arc incandescence one-half of inch. I have in my lamp on the coil or hollow magnet six layers of No. 14 wire. After running about one hour the coil gets so hot that I cannot handle it, and I have to shut down the machine. What is the trouble? The machine does not get very hot. A. Use coarser wire in your lamp helix. You have succeeded very well with your machine.

(5) T. B. asks: 1. Can I use electro-magnets for the dynamo-electric machine described in SUPPLEMENT No. 161, Fig. 6? A. Yes. 2. And if not, how can I make magnets permanent, and from what kind of iron are they made? A. Pern anent magnets are made from steel, hardened and tempered. You will find directions for making permanent magnets in an article on telephones in SUPPLEMENT 142. 3. Can the part surrounding the armature be made of wrought iron pipe, as shown in Fig. 6? A. Yes.

(6) C. S. W. asks: Are there any coal or peat beds in the torrid zone? Where? What is the reason that there are more in the temperate zone than elsewhere? A. No peat. Very little coal of carboniferous period. Tertiary coal, "brown coal," abundant in in South American tropics. A cool moist atmosphere is required to develop peat.

(7) T. C. asks: If a wire be attached to a safe or stove in an office of a hardware store and conveyed to the moist earth beneath, will it be a good protection against lightning? A. No; use a good lightning rod with large ground connections placed in moist earth.

(8) S. S. B. asks: 1. Is it practicable to use three-eighths inch gas pipe for a water grate in an upright boiler having one end connected to pump and the other to the crown sheet? Boiler is 16 inches diameter, 2 feet high, with 19 1¼ flues, 1 foot long. A. You could use them, but they would soon burn out. 2. Is such a boiler large enough to drive a 2 inch by 4 inch engine with 60 lb. steam, and 250 to 300 revolutions per minute? A. It may answer with an exhaust jet, but is rather small without it.

(9) J. E. E. asks (1) how to construct a galvanometer for testing electrical resistances. A. A simple galvanometer may be made by suspending a magnetized cambric needle over a flattened helix of fine wire. For details of construction of delicate instruments of this kind see Prescott's Electricity, or Frick's Physical Technics. 2. Can you give me better detail of the reversing gear of Mr. Maxim's steam launch, SUPPLEMENT No 158? It does not give a clear explanation as to the setting of the eccentric. How far should it be moved to give proper "lead" both ways? Has the loose piece on shaft that works in the drum more than one spiral groove? A. The eccentric will be set in the usual manner, and by throwing it across to the opposite side, it is in position for reverse motion without lead. You must lay out a diagram to get the proper lead and throw for your valve. We do not understand there is any spiral groove, though this would probably be better, as you could then get the proper lead in both directions. 3. What horse power would a 2½x2½ stroke engine give, 300 revolutions per minute, with 70 lb of steam? A. About three-fourths lb. horse power. 4. What size boat can I run with it at the rate of eight miles per hour? Also what size screw and pitch? A. Probably 12 feet long and 3½ to 4 feet beam; screw 14 inches diameter and 2 feet 4 inches pitch. 5. Ports are 30-100 inch area: are they large enough? A. Ports should equal five-tenths inch. 6. What size pump shall I use? A. Half inch diameter of plunger, if it has the stroke of the engine.

(10) W. F. O. asks: Suppose a string fastened at one end will just support a weight of 25 lb. at the other. Unfasten it, and two persons pull upon it in opposite directions. How much can each pull without breaking the string? A. 25 lb. This amount applied to each end brings a total strain of only 25 lb. on the string. Try this experiment with spring scales instead of a string.

MINERALS, ETC.—Specimens have been received from the following correspondents, and examined, with the results stated:

I. P. B.—The incrustation consists chiefly of oxide of iron, lime carbonate, and organic matter. The water is probably unfit to drink. There is no practical way of purifying it. -E. B. S.—It is itacolumite, or flexible sandstone, often found in diamondiferous regions. It has been used for making grinding wheels.—W. H. G.—The slate carries a trace of copper, but probably no silver. A fire assay of a larger sample would be requisite to settle this point.—W. B.—It is a glass colored by oxide of cobalt—cobalt glass.

COMMUNICATIONS RECEIVED.

On Solar and Planetary Force and Attraction. By D. H.

On Stoves. By L. H. B.

On Electrolysis and Demagnetization. By E. A. T.

Instrument for Investigating Pressure. By H. W. F.

Poetry. By T. S.

[OFFICIAL.]

INDEX OF INVENTIONS

FOR WHICH

Letters Patent of the United States were Granted in the Week Ending

April 27, 1880,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

A printed copy of the specification and drawing of any patent in the annexed list, also of any patent issued since 1866, will be furnished from this office for one dollar. In ordering please state the number and date of the patent desired, and remit to Munn & Co., 37 Park Row, New York city. We also furnish copies of patents granted prior to 1866; but at increased cost, as the specifications not being printed, must be copied by hand.

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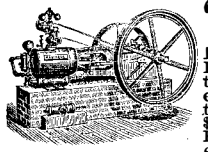

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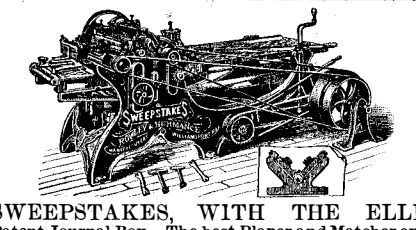

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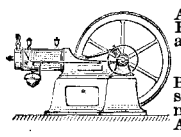

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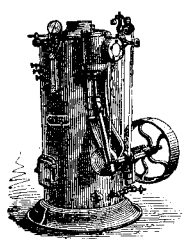

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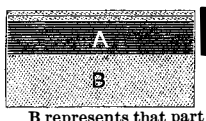

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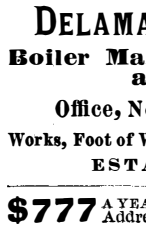

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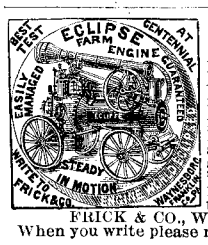

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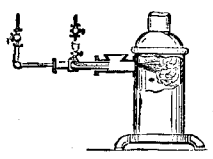

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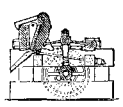

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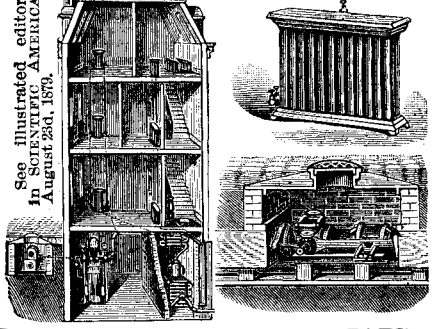

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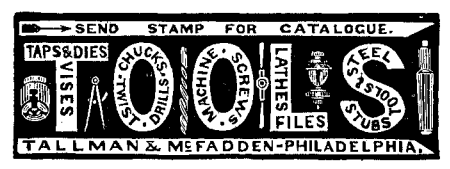

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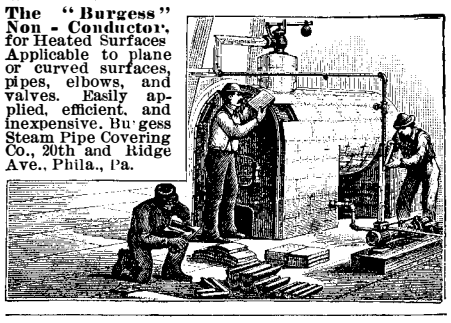

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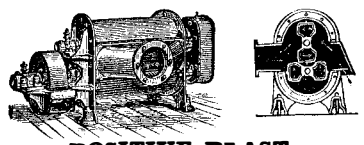

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