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Improved Floating Water Power.

Tide mills and those driven by other water currents are not unusual, but the level of the wheel shaft being fixed, either low water or high water is prejudicial to the full action of the mill. The device shown in the accompanying engraving, being sustained always on the surface of the current, and the connections of the power with the machinery being self-adjustable or automatic, the hight of the water can have no effect on the performance of the waterwheel.

The contrivance consists of two scows or floats connected by cross-bars or timbers, so that they are in parallel lines, and having suspended between them one or more water-wheels of the kind known as undershot. The ends of the floats, or scows, facing the current are wedge-shaped to present little resistance to the current and to divert the stream into the space between the two floats. Projecting also from the bows at the water surface, is a V-shaped guard for defending the wheel from floating timber,ice,etc., or a boom may be used projecting from the shore, as an additional means of defence,when the state of the stream requires it. A gate conforming to the circumference of the wheel, being a segment of a circle, is used also as a guard and to regulate the amount of water impinging on the buckets and consequently the speed of the wheel, as also to entirely stop the wheel by cutting off the stream from the buckets. The main or wheel shaft carries on the shore end a bevel gear that drives a similar gear, from the shaft of which power is carried, by means of pulleys and belts or shafting, to the mill standing upon the bank. The receiving pulley and shaft is hung in a frame, one end of which is hinged or pivoted to the shore side float, or scow, and the other to the mill building. Thus, whether the water be high or low, the belt is always kept "taut," and the machinery driven the same, under all circumstances. Chains or ropes at the ends of the floating scow nearest the shore, and the pivoted frame, hold the floats rigidly in position.

SHEPARD'S PATENT CURRENT MILL.

The wheel may be made with ordinary fixed radial buckets, or the buckets may be pivoted to open and close by their own weight, as those in the engraving, thus offering less back resistance to the water in rising. By lengthening the boats two or more wheels may be used, or a series of floats may be constructed across the stream having their wheels suitably connected, thus multiplying the power indefinitely. It will be seen that the immense expense of constructing dams, and the large damages from flowing lands to form a pond or reservoir are avoided by this plan. It is evidently a valuable device in many localities where sudden rises of water or frequent changes in the condition of the stream prevent a reliable and steady water power.

Patented June 2, 1868, by Albert B. Shepard, who may be addressed for additional particulars at Sand Bank, Oswego County, N. Y.

GLASS STAINING---THE MANUFACTURE OF ILLUMINATED CHURCH WINDOWS.

Although each of half a dozen of the largest cities in America boasts one or more establishments for the manufacture and architectural application of stained glass, by far the finest and best work of all is done, as might be readily supposed, in New York city. There are on Manhattan Island four factories, beside one in Brooklyn, and as the various processes are little understood, save by the mechanical experts and operatives themselves, most of whom observe a profound secrecy, or affect a great degree of mystery about their art, it is thought that a popular account of them may prove interesting to the general public.

By far the greater part of the stained glass made (more than 90 per cent), is used for the decoration of ecclesiastical edifices, and, as a natural consequence, nearly all the designs illustrated are of a scriptural character. Occasionally, though not often, a "memorial window" will be erected in a college or school. A small proportion of colored glass is not unfrequently employed in the ornamentation of some public hall, lecture room, or theater: a little bit of bright fresh color is sometimes given by it to the parlors of a private house; it is even at times degraded to add an additional, and alas, unnecessary attractiveness to the tempting rooms of a gambling hall or a gin palace, but as before stated, the churches claim more than nine tenths of all the work in colored glass.

A rapid description of all the manipulations to which a sheet of common plate or window glass is subjected, and the manner of constructing a window, will run as follows:

The artist first sketches out his idea in pencil on ordinary drawing paper, and elaborates it until the design is complete; he then prepares a large sheet of pasteboard on which he draws the human and other figures of the exact size they are to be in the completed work; the various colors and their gradations are then decided on, and their exact arrangement determined, so that the designer can now tell exactly how many pieces of glass he will require of each color, and how many of each of the several various sizes and shapes. This important preliminary work being accomplished, the brittle substance itself now for the first time is taken in hand.

The material used is for the most part the common window glass of American or New Jersey make, which is purchased in large sheets made especially for the purpose. A very small proportion of glass of the finer colors, the very best rubies, blues, purples, and greens are imported, but by far the larger portion are colored by the American workmen.

The clear uncolored glass is cut with a common glazier's diamond, although the multitude of pieces required and their varied and fanciful shapes make this a seemingly interminable job. This may be readily imagined when we state that one single window of Trinity Church, in New Haven, contains more than ten thousand separate pieces, every one of which was cut and colored singly.

When the requisite number of diamonds, circles, squares, octagons, crescents, and other shapes are cut, according to the number called for by the full size pattern, they are next taken to the painting room, where the color is laid on. This part of the work is very simple, merely consisting in covering, with a common flat brush, one side of each fragment of glass with a thin, even coating of the proper color. These paints are all mineral, as they have to be exposed to an intense heat for many hours, in order that the coloring material may sink into the surface of the glass—be, in fact, so fused with its very substance that it becomes actually a part of the glass, and can no more be separated from it than can the medallion head from the surface of a coin.

The glass stainers' reds and yellows are produced from pure silver prepared with antimony; the blues are made from cobalt; another red comes from oxide of iron; white, from block tin; black, from manganese; green, from copperas; purple is only yielded by pure gold itself. These are all what are known as "enamels," or surface colors, and are not melted through the entire substance of the material. These various mineral substances are reduced to powder by grinding. A "flux" is then prepared from a mixture of red lead, flint glass, and borax, which are melted together in crucibles. To this "flux" the desired color is then added, and the mass is then reduced to a paint, which is laid on with a brush, as before described. While the color is drying on the many-shaped bits of crystal we can take a look at the "kiln," in which they are soon to take a cooking, by the side of which the strongest heat that ever over roasted a turkey and spoiled a thanksgiving dinner would be but as the cooling atmosphere of the latest patent arctic refrigerator. This kiln is merely a brick oven, about five feet by four in dimensions. In the inside of it is a series of shelves made of iron plates half an inch in thickness, and forty-eight inches long by thirty-six inches broad.

These shelves are placed one over another, about an inch apart, from the bottom of the kiln to its top. They are so arranged that the fire can have free access to them all on both top and bottom, and so suffuse them and their contents all in the same steady, fervent heat. On these shelves the painted glass, now dry, is piled in layers twelve or fifteen deep until all the shelves have received their complement, and the oven is full. The heavy iron doors are then closed, and the baking begins. An intensely hot fire is kindled in the fire-box, and in a short time the iron plates and all the many-colored pieces of glass are red hot. The temperature is maintained for eight hours, at the end of which time the fire is drawn, and the glass is left to cool. This cooling is very slow, requiring forty-eight hours, in order that the glass, which otherwise would be as brittle as ice of the same thickness, may be annealed or toughened. When removed from the kiln it is found that the "flux" (being itself in great measure composed of glass), in which is incorporated the color, has melted, and the surface of the previously clear glass plate having also slightly melted, the two have fused together, so that there is now, in fact, a sheet of plain glass having on one surface a thin "veneer," so to speak, of glass of another color, which is so firmly adherent, as to be absolutely inseparable, save at the expense of fracture.

The cooked and colored glasses are now removed to the room of the workman whose business it is to join them together in the proper design. To do this he has a large horizontal table, on which he proceeds to *build up* the proposed window, working by the water color or pencil pattern before him. Beginning at what is to be the bottom of the picture, he lays the lower border of the design, fastening the pieces together by means of flat leaden rods, made for the purpose. These rods are a sort of narrow strip of very soft lead, with a deep groove along each of its sides. Into this groove is placed the edge of a piece of glass of the proper color, and the edge of the groove are bent down so as to hold the glass in a secure grip. A second slip of glass, of another color is then fastened into the opposite groove, and so the "building up" continues, the workman slowly adding piece after piece to his mosaic pattern till the whole is finished. The leaden framework, or sash, is then most carefully covered with a cement of oil, putty, and red lead, which renders it weather tight, and proof against both rain and wind. The window having been then properly framed by the carpenter the work is done.

Glass stainers use two sorts of "ruby" and "blue" glass; in one sort known as "flashed" glass, the color is blown or superimposed on a plain surface, thus making a sort of "veneer," as before described. This peculiar arrangement makes it possible to produce very elegant and beautiful effects by cutting down through the color and exposing the transparent glass beneath, precisely in the same manner that cameos are cut. In the other kind of colored glass, technically called "pot-metal," the coloring material is diffused homogeneously through the entire substance, so that a fracture shows color all through it. For certain uses this sort of material has also its special advantages.

Some very beautiful work is also accomplished in glass, of the sort known as "acid work." This is where the patterns show in delicate white of a semi-transparent hue—the patterns which are mostly chosen from flowers or dainty lace work, appearing as though done in pearl or frost-work. This is commonly known as ground glass. This kind of work is used where heavy plate glass is desired for windows or doors.

The leading agent in the process is hydro-fluoric acid, which works quietly, after this fashion. The plate of glass is laid on a table, and the pattern stretched on it—all parts of the plate except the design are now covered with a thick coating of coach varnish mixed with asphaltum—a ledge or rim of wax, half an inch or so high, is raised round the edge of the plate to dam up the liquid from escaping, and hydro-fluoric acid with three parts of water is poured on to cover the plate about an inch deep. This acid attacks all parts of the glass not protected by the varnish, on which it has no effect, and at the end of an hour, when the liquid is poured off, it is found to have "bitten in" or destroyed the surface of the glass in the shape of the design to a slight but perfectly appreciable depth To have the pattern show white and pearly on a clear surface it is of course only requisite to work in "reverse" or to cover the design with varnish and let the acid "bite in" the border, leaving the pattern raised. Some very elegant doors of this sort are now being finished for the new Park Bank, and for the office of Brown Brothers & Co.

To give an idea of the value added in this art to mere raw materials, by skill and labor, let us mention one piece of work at the establishment of Mr. Henry Sharp, to whose kindness we owe much information about this kind of work which is usually kept sacred from the public eye. In the show room is a piece of common window glass, perhaps sixteen by twenty inches in size, worth originally about twenty-five cents. The paints with which it has been treated would cost about five dollars more, which would be the value of the raw materials. Upon this glass was prepared a specimen work, intended for the great Paris Exbibition, but which never got there as its companion piece was destroyed in a fire. The design was "Jephthah's daughter parting from her companions," and it was so equisitely drawn and colored, and so exqcisitely finished, that the maker has been offered $400 for it, which he refused.

Many fine works are now in progress at the establishment above referred to. Mrs. Samuel Colt, of Hartford, has a memorial window containing a double design; one "Joseph Dispensing Corn," to the memory of the late Samuel Colt, her husband; the other, to three of her children, is "Christ as the Good Shepherd."

Mr. Parrott (whose name is known rather in connection with war than peace) has building a fine chancel window, of a geometrical and mosaic pattern, for a church at Cold Spring, N. Y. Beside these there are windows for the Catholic Cathedral, Portland, Me.; Episcopal Church, Hartford, Conn, Episcopal Church, Benicia, Cal.; Episcopal Church, corner Fifth avenue and Forty-fifth street, New York; St. Peter's Presbyterian Church, Rochester, N. Y.; Episcopal Church, Bay Ridge, L. I.; Episcopal Church, Bush's Mills, N. Y.; Episcopal Church, Geneva, N. Y.; Episcopal Church, Newport, R. I.; Episcopal Church, North Salem, N. Y.; Congregational Church, Tankhannock, Pa.; Catholic Institute, Altoona, Pa.; Wesleyan Female College, Cincinnati, Ohio. Beside these are many single memorial windows, all of which are at present in process of building, about twenty men being employed in the work. The demand for windows of stained glass is largely on the increase since first-class work has been made in this country, as the above partial list will show.

Some little idea of the cost can be gained from the knowledge that the glasswork for the Colt Memorial Church will cost $7,000, the chancel window alone calling for $2,000—the great chancel window of Trinity Chapel, corner of Twenty-fifth street and Fifth avenue, New York, costing $5,000, etc., etc. In fact, so excellent is the New York city glass work reckoned, and so great is the demand for it, that the facilities for its manufacture have been more than doubled in the last two years.—*N. Y. Times.*

THE BRITISH ASSOCIATION.—The accounts of the local committee ror conducting the Norwich meeting of the British Association for the Advancement of Science have just been made up, and show a balance of £332, to be applied as follows: £50 for the purchase of elementary scientific books for the Norwich Free Public Library, the selection to be left to the Rev. Hinds Howell; £100 to be granted to three trustees for the purchase of meteorological instruments for Norwich; and the balance to be granted to the Norfolk and Norwich Museum unconditionally. The next meeting of the Association will be held at Exeter.

Influences of the Different Trades and Professions as Causes of Consumption.

(From the Atlantic Monthly.)

This question is of *vital* importance to every young person about to choose a profession or trade as the business of life. It is worthy of the maturest thought of every parent and every philanthropic employer; for upon the proper choice of a trade or profession will depend much of the future weal or woe of the youth just commencing life. At present there seems often to be, while making the choice, a woeful amount of ignorance of the common rules of health.

We may consider the question in two lights; namely, first, as it regards perfectly healthy youth; and, second, as it has reference to one that is either in ill health or who from physical organization or hereditary tendencies is liable to suffer from consumption.

And, *first*, it is undoubtedly true that a man may take any of the various trades or professions, and if he only do not neglect the rules of health, he may practice without injury any of these arts even to advanced life. Nevertheless, there are some which, from their very nature, or their necessarily accompanying circumstancs, are less healthful than others. Among these may be named all those practiced in places in which fine dust is floating in the air, whatever that dust may be Especially deleterious is the trade of machinist, in working at which quantities of fine steel dust are set flying; or the knife and scissors grinder's trade, in which, in addition to the steel, a cloud of emery dust is drawn in with almost every breath. It is true that some of these various dusts do not produce real tuberculous disease, but they all tend to clog up the finer air-cells of the lungs, and are liable to cause cough, emaciation, and death. at times with tubercular complications.

Next, perhaps, in order come all those trades that cramp the chest, and prevent free expansion of the lungs, and incline the patient to bend forward, thus permanently diminishing the caliber of the chest, compressing the delicate structure of the lungs, causing obstruction therein, with subsequent disease and death. Prominent among these trades stand such as that of shoemaker for men and that of seamstress for women. These are essentially sedentary in their nature, and have most strongly marked tendencies of the nature alluded to. But they likewise lead to the various forms of dyspepsia, to irregularities of the digestive and of other of the more delicate functions of the body. These latter complaints are too often found, when we unravel the history of cases of consumption, to be the precursors for months previously of the dreaded affection of the lungs. The whole internal arrangements of many large establishments for "slop" work, where perhaps from fifty to a hundred young women or men are collected in large unventilated rooms, are simply an outrage upon common decency, and infamous with regard to arrangement for the health of the employés. How general it is we know not, but not infrequently we have been informed by patients that at times, for example, no water closets can be found on the premises, or, if found, they are in a deplorable state. Hence constipation and indigestion come to add their weight to the deleterious influences of the trade itself

Less constantly confining to the chest, but as employments analogous to the last mentioned trades in effect, we may name those of clerk and student. Both tend to induce inaction of the entire body and a curving forward of the chest; and although neither of these professions *necessarily* produces disease, and although it is possible for the student and clerk to avoid the evils that are impending, they very frequently do not avoid them, either from their own gross ignorance of hygienic laws, or from the cupidity of the employer, which prevents them from properly attending to the same. Those employed are at times compelled to work in houses totally unfit for human beings to inhabit, while at other times love of gain deprives them of the requsite time for the taking of food.

Such cruelty on the part of employers, we admit, is rare. Moreover, we are inclined to think that there are but few who willfully sin in this manner. They have ample means, and money with them is resolvable into human labor. In modern scientific language, of "the correlation of forces," they virtually say, "With the force of so much money we ought to get a corresponding degree of human force applied to the purposes required." Under this idea, the health of those employed is considered of but secondary importance. We confess that we think there are few even of our worthiest employers who have the perfect health of those employed seriously at heart: and this is not derogatory to them; for it is simply human nature, and will continue as long as our present mode of conducting business is continued. When a true Christian co-operation is introduced into all the channels of business, then, and not till then, will those employés see to it that everything is done to prevent detriment to their lives during their hours of toil.

Another evil tendency of certain trades is to require sudden transitions from heat to cold and wet to dry, the long continuance in cold, damp cellars or warerooms half underground, which, even in the heat of midsummer, though deliciously cool to the transient customer, are most deadly in their influences upon those permanently employed therein. Of such employments is that of the molder, with his constant wet about him, and the beer bottler's, who lives most of the time in damp, dark cellars; and analogous to these cellars in their influence on human health are the cool, damp underground rooms of dry goods dealers, in all our streets of business. These each and all tend to produce consumption, and are therefore nuisances as at present managed; for anything is a nuisance that tends to destroy human life. We have had to warn not a few clerks of the risk they were running in staying in such places. If they fly from them early, they may be saved. If they continue after health is once seriously impaired, they are doomed. Such places ought to be forbidden by law, and, when a proper public sentiment arises, this will be done.

We have thus far considered the influence of these various kinds of business upon persons in perfect health; and we may merely add, that, if there be danger to those in health, it will be madness on the part of those having hereditary tendencies to tubercular disease, or who are actually diseased, to enter them, or into any of an analogous kind. Strange as it may seem, we find often an utter neglect of these rules, and pursuits in life are commenced without a thought of the effect on future health.

History of Hats and Hatting.

One of the most practical and readable technical works we have seen is "A Treatise on Hat-making and Felting," by John Thompson, a practical hatter, published by Henry Carey Baird, Industrial Publisher, 406 Walnut street, Philadelphia. It contains in a condensed form all the information requisite to a full knowledge of materials and the manipulations necessary to manufacture them into hats; also the application of machinery to hat-making. The following sketch of the history of hats and hat-making extracted from its pages, will be found of general interest:

The word hat is of Saxon derivation, being the name of a well-known piece of dress worn upon the head by both sexes, but principally by the men, as a covering from the hot sun of summer, the cold of winter, a defence from the blows of battle, or for fashion. Being the most conspicuous article of dress, and surmounting all the rest, it has often been ornamented with showy plumes and jewels, and with bands of gold, silver, etc. It is generally distinguished from a cap by its having a brim, which a cap has not, although there are exceptions even to this rule of distinction, for there are hats that have no brims, and there are also caps that are provided with a margin. Those hats that are made of fur or wool have all been felted, and felt, strictly speaking, is a fabric manufactured by matting the fibers together, without the preliminary operation of either spinning or of weaving.

We find but little of hat-making recorded in history, and anything relating to hats is extremely meager, although their partial use may be traced back to the time of ancient Greece amongst the Dorian tribes, probably as early as the age of Homer, when they were worn, although only by the better class of citizens when on a distant journey. The same custom prevailed among the Athenians, as is evident from some of the equestrian figures in the Elgin marbles.

The Romans used a bonnet or cap at their sacrifices and festivals, but on a journey the hat with a brim was adopted. In the middle ages the bonnet or cap with a front was in use among the laity, while the ecclesiastics wore hoods, or cowls.

Pope Innocent, in the thirteenth century, allowed the cardinals the use of scarlet hats, and about the year 1440, the use of hats by persons on a journey appears to have been introduced into France, and soon after became common in that country, whence probably it spread to the other European States.

When Charles VII. of France made his triumphant entry into Rouen in 1440, he wore a felted hat.

Hatters of the present day most generously ascribe the honor of the invention of felting, and of its prospective introduction to that of hat-making, to the old renowned Monk St. Clement, who when marching at the head of his pilgrim army, obtained some sheep's wool to put between the soles of his feet and the sandals that he wore, which of course became matted into a solid piece. The old gentleman, philosophizing upon this circumstance, promulgated the idea of its future usefulness, and thus it is said arose the systematic art of felting and of hat-making.

However all this may be, still the invention of felted fabrics for the use of man may have been, as some assert, very ancient and of quite uncertain origin. The simplicity of its make, as compared with that of woven cloth, shows all speculative assertions to be rather uncertain.

However obscure the origin may be, we learn that the first authentic account of hatters appeared in the middle ages, in Nuremburg in 1360, in France in 1380, in Bavaria in 1401, and in London in 1510.

The hatting trade of the United States of America is noticed first in the representations made by the London Board of Trade to the House of Commons, in the year 1732, in which they refer to the complaints of the London hatters, regarding the extent to which their particular manufacture was being carried at that time in New York and in the New England States.

A look at the fashions and mode of dressing in ancient times causes amusement. So capricious is the fancy of man that nothing is immutable, all is change, and hats have been of all conceivable shapes and colors, and dressed with the most fanciful decorations, plumes, jewels, silk-loops, rosettes, badges, gold and silver bands and loops, etc., etc.

The crowns and brims having been in all possible styles from the earliest period, it would appear that nothing is left for the present and all coming time, but the revival of what has already been, even to the fantastical peaked crown that rose half a yard above the wearer's head

In the fifteenth century, hats in Great Britain were called vanities, and were all imported, costing twenty, thirty, and forty English shillings apiece, which were large sums of money at that early period.

The most extreme broad brims were worn about the year 1700, shortly after which the three-cornered cocked hat came in, and about this time feathers ceased to be worn, the lingering remains being left for the badge of servitude to the gentleman's attendant. Metal bands and loops were only regarded as proper for naval and military men of honor.

It is a singular historical fact that the elegant soft hat of the Spaniard has remained the same from the earliest period to the present day, while among all other civilized nation a transformation in the style of that article has taken place. Comfort in the wear seems to have given place at all times to fancy and the demands of fashion.

Queen Elizabeth's patent grant to the hatters of London is still recognized in England, and the 23d of November is the hatters' annual festival, that being St. Clement's day, the patron of the trade.

A Remarkable Stone--Supposed Enormous Black Diamond.

Mr S. L. Young, of New Boston, Ill., writes us a description of a remarkable stone found by a soldier during the late war, back of Atlanta, Ga., during the siege of that city, and now in the possession of a gentleman residing in New Boston. He says:

It is a stone of most curious formation, being seven eighths of an inch long, two and a half in circumference, weighs two ounces, and has evidently been broken at one end. The other end has eight facets; the sides are prismoid or dodecahedra. It is shining black, partly covered with a crust of a brownish color. There are places on it that have a very brilliant natural polish; it resists the action of the hardest file, reducing it to smoothness in a very short time, and burnishing the file as completely as the finest emery stone would, and in much shorter space of time. Nitro-muriatic acid (aqua regia) has no action upon it. It has been immersed in the acid for ten days without producing the least effect. It will cut glass with the facility of the glazier's diamond. The end, where broken, presents a laminated appearance; not flakey, but as though it had split.

A number of lapidaries have examined it and pronounce it of value, some of great value; a Jew sutler, who examined it, offered at once over one thousand dollars for it; but the gentleman who owns it, thinking from his eagerness that it might be worth very much more, refused his offer, and still retains possession of it; though I understand he has had a number of better offers since, which he also refused.

After a careful examination of it I have very little hesitation in pronouncing it a black diamond worth many thousands of dollars. I am a practical jeweler, and have had considerable experience with valuable stones; and have given this one a critical examination, and subjected it to all the tests at hand. Believing it to be worthy the consideration of more scientific men, I have concluded to furnish a description of the stone for the perusal of the many readers of your excellent journal, and will take pleasure in giving any further information in my power to any one who may choose to address me on the subject.

Should our correspondent's views in regard to this stone prove correct, and it certainly seems as though they may, this will be a lucky "find" for the possessor of the stone in question, should it be without defects.

Practical Utility of Mathematical Science.

The following extract from *Mc Hugh's Philosophy of Teaching*, may serve to set right those who have been led to believe that the utility of mathematics beyond the knowledge of arithmetic is questionable:

The use of the mathematical science is as little understood by many as the sciences themselves. This is quite natural, for according to the current belief, arithmetic is the science of numbers; what, then, is the use of any other? Schoolboys think that when they thumb over their arithmetic they are fit for any business. All our writers on arithmetic define it "the scicnce of numbers;" we do not blame boys for believing what they have been taught by their highest authority. Arithmetic is not the science of numbers. This is a bold utterance; let us see if it be true: A merchant performs all his calculations by arithmetic; a banker, broker, collector of taxes, etc., count by arithmetic: here we stop. Arithmetic (without giving a definition) goes not one step outside commercial life. This must be strange to Eddy and Tommy.

Look at our country, 3,000,000 square miles—how do we know? By arithmetic? Arithmetic has no more to do with this calculation than it has with shoemaking. Here is my farm from which I want thirty-seven acres cut off parallel to the State road—how is it done? Arithmetic has no more to do with it than baking. Here is a site for a public building; but ere the mason commences, he must get a plan from an architect. Arithmetic has no more to do with architecture than with churning.

Barrels are measured by conic sections; the calculations of architecture, engineering, marine investigations, the machine shop, altitude of mountains, level and curve of railroads, etc., are each and all wrought out by abstruse mathematical investigations, of which arithmetic forms the A B C, or introduction. How difficult for Eddy to understand what science is!

Any young man, having ambition to excel, possessing energy, industry, tact, and talent, can learn the essential parts of these in a few years with the aid of a good teacher; then he is a theorist. He must go to the machinist, engineer, or architect—to the workshop, office, or the sea: after years of practice, he is a master. How difficult for some parents to understand the necessity of these sciences for their children—anything beyond the rudiments; how difficult to introduce any system in many of our schools, particularly in rural districts, where it is most needed; how difficult for teachers who have capacity to introduce any thing beyond the ordinary course—that of forty years ago—those stern and abstruse sciences, by which the Egyptian discovered the boundaries of his farm when old Nile's flood had passed from its cloudless valley; by which Archimedes saved Syracuse, and rendered it famous as his neglected tomb. It is difficult to understand how an engineer will open a tunnel on each side of a hill, set laborers to work, and meet without any guess in the right line within.

If Ann Jones makes an experiment in baking, and fail, it is a small matter; but if an engineer make an experiment at a tunnel or suspension bridge, and fail, it would be a serious and expensive affair. Hence we see the use of mathematical science, and the necessity of our high-minded youth bracing themselves for the noble and glorious world of beauty before them—the field of mathematical investigation. For independent minds who can bridle self—a thing very desirable and sometimes difficult—it is the only stepping stone to greatness.

Here is a machine shop; look at all the wheels, belts, pulleys, lathes, etc.; how were they placed? Arithmetic has no more to do with the calculations of this shop than with sawing wood! The ship *Atlantic* is in port bound for Liverpool—how will the captain steer her thither? Arithmetic has no more to do with marine calculations than with fishing. Our year contains 365 days and over—how was this discovered? See the curve on the railroad—outer curve elevated; see that suspension bridge, tunnel, steeple, hight of the Andes—how were these things built or found out? See these barrels filled with liquid for market, how are they measured, for measured they must be? Eddy says by arithmetic. He is mistaken.

We see a man in any business outside of commerce, he follows mathematical laws, seldom of his own study. Such men generally have books containing a well-digested code of laws, in the shape of rules, drawn up by some eminent mathematical scholar, of whom, or of whose study, the workman takes no account.

Hence the difficulty of finding a man successful in anything to which he has not been bred—the impossibility of finding that Yankee who does everything. Had Archimedes left his geometrical diagrams in his study, the Romans would have been masters of Syracuse sooner. Geometry, not arithmetic, saved the city. Had Newton and his peers left their mathematical investigations and turned the energies of their mighty minds to parrots and lapdogs, parks and castles, our mechanical works would be few, clumsy, and defective. We, swains, see one of these men sauntering by the roadside, incapable of enjoying the comforts of life from the abstruse nature of their studies, and we look on them as fools; yet their works may overturn some of the existing modes of life, and give a new direction to the energies of mankind. Archimedes drew mathematical figures on his body, which had been anointed with oil, when forced by his friends to go to the theater—so says Plutarch; he could not find enjoyment there. Our books of arithmetic contain very crude rules, requiring the sciences of geometry and algebra combined to teach them successfully.

Thirty-five Years of Progress in Art and Science.

We have before us the address delivered by Hon. J. D. Caton, late Chief Justice of Illinois, on the occasion of the laying of the corner stone of the new State House at Springfield, Ill. The orator, in speaking of the early judges of that State, says:

As these men traversed the great prairies on horseback, going the circuit rounds, probably not one of them foresaw how soon railroads would change the mode of travel, and that soon their successors would accomplish in an hour the distance which occupied them a day. Could they have anticipated all that has come to pass, we may well doubt whether they would willingly have changed the close companionship, the genial feeling, and I may add, the jolly times which they enjoyed, for the colder atmosphere and more selfish habits which seem to have grown up under the influence of modern improvements. Who now seeks to pay another's bill, or offers his friend a passage ticket? If the promotion of human happiness be the greatest attainable good, and worthy of our most anxious care, we may pause a moment in our admiration of the great things lately done among us. Who shall say that there is more genuine happiness, more cordial good feeling more brotherly love, now than then? But if the sigh of regret is forced from us, that many bright and pleasant scenes of the past can never be repeated, we may not disparage that which has added so much to the greatness and the wealth of the present of our State and Nation, and promises so much more for the future. We who have witnessed all, can hardly appreciate the wonderful truths. If it seems extravagant to assert it, a moment's reflection will convince us that the world has made more actual progress within the last fifty years, during our existence as a State; yes, I will say within the last thirty-five years, since first I became one of her citizens, than in all previous time since Adam was driven from the garden of Eden.

First, I will refer to the means of locomotion and transportation. Until the introduction of railroads, what improvement had been made in these since the earliest dawn of civilization—at least since the horse was domesticated and the wheel had been invented? The Queen of Sheba could visit Solomon in as great state, and with as much ease, comfort, and expedition, as Elizabeth could visit Kenilworth, or even Victoria could visit Balmoral; Jackson had no better means for going from the Hermitage to the capital than had Cæsar for visiting the provinces; Napoleon transported his great armies in the same way that Alexander moved his into Asia. Only in our day has it become possible, as has been often demonstrated, to move a great army, with all its *impedimenta*, a thousand miles in two days, which would have required, only the preceding generation, as those of three thousand years ago, many months to accomplish, at a great expense of treasure and human suffering. Thirty years ago the same means were used to cross the ocean which Columbus used to reach America; then our national representative went to St. James by the same agency which Paul used to reach Ephesus and Athens; now every sea and ocean is traversed by steamers which court the contrary winds, and lay their course from continent to continent with scarcely the variation of a single point.

Within the same period gas has been adopted for the production of artificial light. Since the time when lamps were first lighted, till the time when I sat upon the bench in yonder state house, by the dim glimmer of a few tapers, but the least imaginable improvement had been made in artificial illumination. How great the contrast since the introduction of gas; one burner of which gives twenty times the light of our best candles, and if a brighter—a more conquering light is still desired, we have but to apply to Drummond, when the darkness is dispelled almost as by a mid-day sun.

I might allude to many other great inventions and discoveries of the present age, for the advancement of human thought and enterprise, but time permits a reference to but one, the most wonderful and mysterious of all. The magnetic telegraph presents the means for transmitting information at great distances, with a celerity which, before our day, was only practicable within the compass of the human voice. Till within the last twenty years we were provided with no more speedy means to send information, to a distance of one mile or a thousand miles, than were the Pharaohs or the Kings of Israel, the Incas of Peru, or the Montezumas of Mexico. Now the time is quite inappreciable which is required to send information the greatest distances, and even beyond the broad Atlantic. Had it been proposed to Jackson to send a message from the Hermitage to the capital with the speed of the wind, he would have listened to it with incredulity: then what would he have said to the proposition of Morse, to outstrip the velocity of the meteor with his message to Washington.

I cannot resist the temptation to barely mention one other great invention, which, if of less value as mere business matter, is scarcely less wonderful, and surely gives as much joy to the human heart; I allude to the sunlight pictures, which now fill every palace and every cabin with the faithful portrait of loved ones absent and present, who shall thus be handed down from generation to generation. I am sure I do not stand here alone to regret that this sublime art was not invented in time to perpetuate the lineaments of faces much loved, but gone, alas, too soon.

Am I not right, then, in saying that the world has made more progress in the last thirty-five years than in all the ages that have gone before? Surely we are now in the La Chine Rapids of time, which hurry us along with a giddy velocity, amid scenes so changing that we can only glance at their most prominent features. It is folly to say that we should have a care lest we strike some hidden rocks by which the channel may be beset, lying not far beneath the surging surface.

Supposed Traces of Man in the Paleozoic Age.

The Buffalo *Courier* has the following:

"There are now on exhibition at the rooms of the Society of Natural Sciences, in this city, two of the most remarkable discoveries recorded in the annals of science. One is the fossil imprint of the foot of a man, or rather the cast of such an imprint. It was discovered by a workman, in a colliery in western Pennsylvania, in the shale overlying a run of coal and underlying two other veins which were being worked by the company. The spot where it was found was nearly a mile from the pit's mouth, and some three hundred feet from the surface. The rock in which it was imbedded belongs to the paleozoic age, and the imprint, if such it be, was made millions of years before the present geological era commenced. It is the cast of the left foot of a man of ordinary size, and is perfectly defined. The foot was evidently protected by a sandal or mocassin; the heel, the arch, and the ball of the foot, and the slight depression made by the toes are perfect, and whether produced by the foot of a man or a freak of Dame Nature, the cast is as perfectly defined as if it were the work of a sculptor.

"By a curious coincidence, the society, a few days before this donation, received the second specimen from the Rev. Samuel Cowles, of Gowanda. It is a large slab of sandstone, on which, stamped in the solid rock, can be seen the imprint of horses' hoofs, as perfectly preserved as though they were formed but yesterday upon the muddy bank of a sluggish stream. There are at least a dozen of these impressions, varying in size from the track of the full-grown horse to that of a young colt. They point in different directions, as though the animals were leisurely walking about and cropping the luxuriant grasses of that tropical period, some of them being partially obliterated by the more perfect form of a fresher imprint.

"Mr. Cowles has sent a similar specimen to the professors of Yale and other colleges, and we look with interest for the theories of these high authorities respecting the nature and character of the tracks, by what formed, and the condition of the earth at the date of their formation. If the theories of the discoveries be correct, the result will be to entirely overthrow the present received geological system, and to further complicate that terrible question, the effort to solve which has caused learned men so many soul-disturbing doubts and fears, and which brought Hugh Miller to so tragical an end, that is, whether the geological and scriptural records of the world's creation are reconcilable?

"The fossil foot-print was presented to the society by John Magee, now in Europe. We advise all who take an interest in geology to inspect for themselves these curious specimens, which affects that science so momentously."

The Mines of Nevada.

From Browne's United States Government Report of the mineral resources of the West, recently issued, we glean the following facts. The official statements of ten companies working mines in Nevada give the amount of bullion produced by each during 1867, viz.—

Hale and Norcross....	$1,097,297·45....	owns 400 feet of mine
Savage..............	3,737,100·12....	owns 800 feet of mine
Crown Point..........	920,717·96....	owns 600 feet of mine
Yellow Jacket........	1,729,276·91....	owns 1200 feet of mine
Gould & Curry......	614,620·51....	owns 1200 feet of mine
Chollar Potosi........	2,668,885·36....	owns 2800 feet of mine
Empire M. & M......	278,607·17....	owns 75 feet of mine
Imperial............	1,106,465·50....	owns 184 feet of mine
Kentuck............	1,140,741·94....	owns feet of mine
Overman............	192,318·17....	owns 1200 feet of mine
Total............	$13,486,061·09	

The average cost of mining the ores, including "dead work," was about $9 per tun, and the average cost of their reduction was $16 per tun, from the pulp assays it was shown that only about 64 per cent of the gold and silver which the ores contained was saved, proving a loss of near $5,000,000 from the workings of the ten companies above named. The average yield of the ores from the mines of these companies did not exceed $50 per tun, and as the cost of mining and milling the ores was $25 per tun, only about one-half the yield was profit. This can be taken as an average result, except richer ores cost no more to mine reduce and mill, therefore pay a larger per cent of profit.

The completion of the overland railroads, the discovery of coal at several accessible points, and the improved modes of working the ores, with the great reduction in cost and general expenses of carrying on mining enterprises must secure such results in the future as have only been anticipated in the past.

Most of the ores will be reduced by the smelting process, and all metals run into bars, at or near the mine, and these bars containing gold, silver, copper, lead, antimony, etc., must be taken to assay establishments for separation; and in many cases the precious metals will be all profit, the other metals being of sufficient value to pay all expenses.

Capitalists are now turning their attention to mining enterprises and single investments of $10,000 to $25,000 show thd confidence they have in this line of business. With good mines, good management, and ample capital no one need fear the result. This branch of American industry should be encouraged in a substantial way, and it cannot fail to be remunerative.

The Bulk of the World's Gold.

The New York *Mercantile Journal* in discussing the folly of attempting to conduct the future business of the world upon a gold basis makes the following statements:

All gold that exists in the United States to-day, could be placed in a square box of less than fifteen feet in length, width and depth.

A room one hundred feet long, one hundred feet wide, and ten feet high, would hold eight times the total amount of gold in the known world.

The "Golden Calf," worshiped by the would-be statesmen of our day, who desire an accumulation of coin to the extent of $250,000,000 in our National Treasury, as a basis upon which to resume specie payments, if melted down would not fill a square box measuring nine feet each way.

How puerile then, to clog the wheels of finance and commerce by a blind subserviency to the ridiculous tenets of the dark ages. Coal and iron are infinitely more valuable to commerce than this boasted metal.

Plugging Screw and Brad Holes on Finished Work.

A correspondent of the *Coachmakers' Journal* says:

In plugging screw holes we glue the edge of the plug; put no glue in the hole. By this means, the surplus glue is left on the surface, and if the plug does not hit the screw it will seldom show. We set the heads of brads well in, then pass a sponge of hot water over them, filling the holes with hot water. This brings the wood more to its natural position, and closes, by degrees, over the head of the brad. When dry, sandpaper off and paint, and the putty will not hit the head of the brad; if it does, it will surely show bad. The brad must have a chance to expand when exposed to the heat of the sun, and not hit the putty; if it does it will force the putty out. We have had no trouble with brad heads or plugs since we adopted this practice.

Improved Two-Wheeled Velocipede.

The *furore* created by the introduction of the velocipede in Paris has extended to this country, and in our principal cities the demand for this elegant and graceful vehicle is so great that quite a number of extensive establishments are being devoted to its production, yet the demand cannot be supplied. For ease of motion and grace of action the velocipede ranks with the skate, with this advantage, however, that the former may be used at all seasons, instead of being restricted to periods of freezing temperature.

Like every other machine which we have copied from other peoples, this has been materially improved by American mechanics. One of the most perfect of these machines we have seen is that represented in the engraving. It is very strong, light, easily operated, and under the most perfect control. The foot-rests, or stirrups, are so weighted and hung to the cranks that they always present the surface to the foot, so that in mounting, or after removing the foot temporarily, no time is lost in adjusting the foot. The brake is always ready for action when descending grades or reducing speed, it being operated by the hands through the medium of the steering bar. To effect this the bar rotates in sockets, and has connected with it a strong line or gut, secured at the other end to the brake lever. By simply turning or rolling the steering bar the line is wound around it just as is the chain of a rail-car brake. The steering post of this improved machine rakes well aft, so that the bar is within easy reach of the hands, enabling the rider to keep his arms in a natural and easy position and his body erect. In addition, the saddle, or seat of this machine is movable from front to rear or *vice versa*, so that one velocipede may be adapted to the size of the rider without shifting the crank pins, the saddle being held in place by a simple thumb screw.

With those who live in the cities and require a daily exercise, exhilarating, pleasant, healthful, and free from expense; with those who reside in the country and have long distances to traverse daily in reaching the scene of their labors, or with those who have leisure and wealth at their command, but love such exercises as afford an opportunity for the display of grace, agility, and skill, the velocipede will soon become as great a favorite in this country as it is already in France and England.

THE MONOD IMPROVED VELOCIPEDE.

To learn how to manage the velocipede requires no more skill, courage, or patience than to acquire the art of skating, perhaps even less, and when the art is once learned, as it may easily be in a few days, it provides a means of locomotion and a source of enjoyment as much more available and delightful than the art of skating as the number of the days in the year is greater than the few bright mornings when only you can find a smooth, glassy, and well-frozen skating ground.

A school for beginners has been established at No. 3 William street, New York. All orders for machines or requests for further information should be addressed to G. H. Mercer & Monod as above.

Remarkable Transformation in Reptiles.

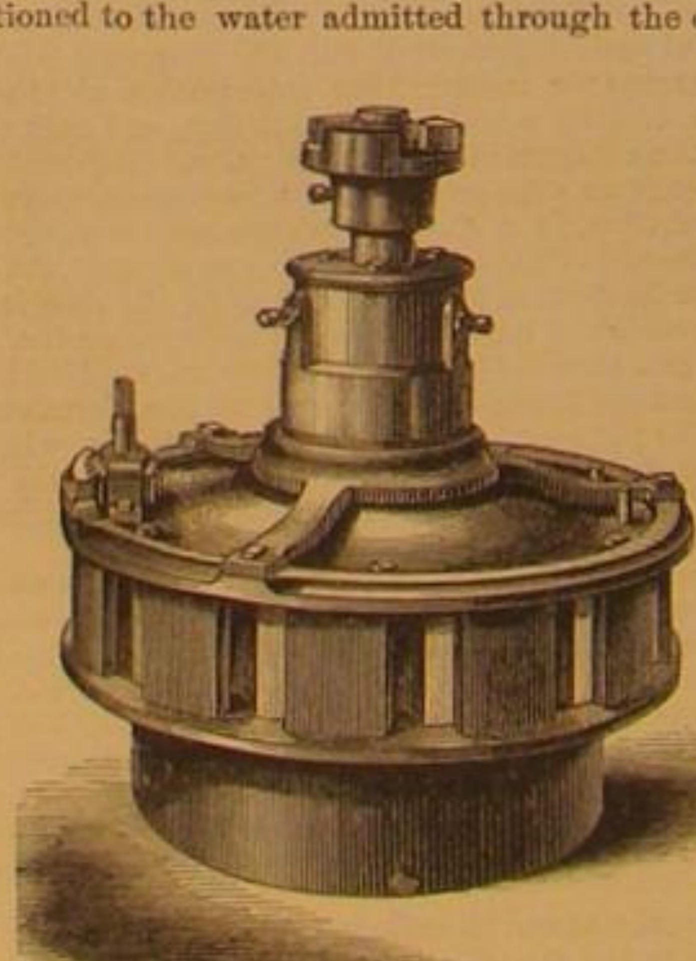
In the November number of the American Journal of Science, Professor O. C. Marsh of Yale College, has given an interesting account of the metamorphosis of some peculiar reptiles which he obtained in the Rocky Mountains during the past summer. The animals were caught in Lake Como, a small brackish sheet of water near the Pacific railroad, and about seven thousand feet above the sea. They are known in that region as the "fish with legs," and by naturalists have hitherto been placed in the genus siredon, and considered closely related to the axolotl from the table-lands of Mexico.

On bringing the specimens to the warmer climate of New Haven, one of them began to undergo a remarkable change. Dark spots appeared on the sides and finally extended over the rest of the body. The fins on the back and tail and the external gills gradually disappeared, and the animal came frequently to the surface of the water for air. The body also diminished in size; the head changed in form; and the eyes became more prominent. The mouth and tongue became much larger, and the teeth changed in position. During these alterations the animal made frequent efforts to leave the water and at last escaped as a true salamander, representing a different genus and even family of reptiles from that of its original condition. Subsequently several other specimens underwent the same metamorphosis, during which various experiments showed that the rapidity of the change was greatly affected by variations in light and temperature, the individuals most favored in these respects having passed through the entire transformation in about three weeks.

Whether this species ever changed in Lake Como and in other similar elevated regions is uncertain; but that it breeds in the siredon state, like the Mexican axolotl, there can be little doubt. This unexpected metamorphosis renders it extremely probable that all siredons are merely young salamanders which have been prevented by peculiar physical condition from attaining their full development—a new and interesting point for the supporters of Darwin.

BURNHAM'S IMPROVED TURBINE WATER WHEEL.

The turbine wheel is worthily and rapidly replacing the old fashioned breast, overshot, and undershot wheels, both for its economy of space and cost and its utilization of power. It is but little affected by "back water," and runs under circumstances very adverse to the economical and profitable employment of wheels of other descriptions. But, as generally constructed, the turbine lacks in the quality of delivering the same proportional amount of power under relative circumstances, as, while it may develop its full power with a full head and free gate, it does not give a proportionate amount when the quantity of water is reduced by a partial closing of the gate. In some wheels this is occasioned by a diversion of the direction of the current or a change in the relative angle of the stream and the face of the bucket, and in others by a check in the velocity of the water admitted to the wheel; in either case destroying the proportions between the position of the gate, and consequent admission of the water, and the amount of power developed by the wheel. The one represented in the engraving, however, delivers a power exactly proportioned to the water admitted through the openings in



the register gate. If the latter be one-fourth open the wheel delivers one-fourth of its whole power; if, with one half, it moves with one-half its power.

The case is one casting, with the waterways and chutes formed by cores. Outside of this is the register gate, entirely surrounding the case, and having apertures corresponding to those in the case, for admitting water to the wheel. This gate can be moved by means of a hand wheel, pinion, and segment, sufficiently to cover the inlets or ports in the case, when the water will be entirely shut off. The bottom of the case contains a spider or bridge, that holds the box or step for the wheel shaft, and the top is covered with a cap, the top of which holds the box, that steadies the shaft. A concave hub, its largest diameter uppermost, is keyed to the shaft, and to its outside the buckets that form the wheel are bolted. The buckets are straight or vertical, for about half their length, or as far as the hub is concave, then curved to suit the velocity of the water. The water, whether the gate is entirely open or partially closed, strikes the buckets at right angles, acting first by concussion; it is then forced downward by the concavity of the hub, and acts by its weight on the lower or curved parts of the buckets, escaping, when it leaves the wheel, with a velocity corresponding to that of the wheel.

The patentee says this wheel, costing from thirty to fifty per cent less than any other wheel of the same finish, will yield an equal power; it is simply constructed and durable; has less leakage and friction, and occupies less space than any other wheel of the same power; will give a greater per centage of the power from the same quantity of water, and works well in back water, beside other advantages obvious to millwrights.

Patented February 22, 1859, and March 3, 1868, by N. F. Burnham, who may be addressed at York, Penn., for further information.

The Mastodon and Mammoth Period.

Dr. J. F. Boynton delivered a lecture upon the above subject at Cooper Institute on the evening of 21st Dec. in which, referring briefly to the subject matter of his preceding lecture, he said that when we arrive at the tertiary formation we come to the period of warm-blooded animals. Among those have been found animals of the marsupial department of animated nature, like to the kangaroo. The marsupial race have a second embryous state; the young remaining in the female pouch till they are old enough to take care of themselves, like other animals, shortly after they are born. He next came to the ornithorhynchus species, with a beak like a duck. The lecturer here described the peculiarity of this bird and its connection, anatomically speaking, with birds and reptiles. The creatures first suckle like animals, then they become more bird like. They can be domesticated for a time, but if they ever get their freedom to go where they like, the animal never returns. Referring to the orders of life at the present time, he would now refer to his diagrams. There were animals which walked upright and others that walked horizontally. On the diagram he pointed out the tertiary period of animals in which the orders of life were not nearly so numerous as in the preceding ages—the Devonian and others. The first figure presented on the chart was the turtle. These animals when they are hatched from the eggs are a perfect type of the older animals. Remains of turtles have been found of such size, that when they were in this life they must have weighed a ton. The next presented was an animal that can be tamed and made familiar in the houses of the people. This was the horned lizard, a hideous, but a very harmless animal. The animal, not more than three or four inches in length, sits like a squirrel cracking nuts. The next animal presented was the parasite of the tertiary formation, a very small animal, known as the louse, found on mice. The next was the "wicked flea, that no man pursues, but is always pursued by the ladies." This animal lives on the surface of animals and is generably very troublesome. There is another animal that infests the brain, liver, lungs and flesh. This is the internal worm. Speaking of the hog disease, these are the animals that attack and disease the hogs—a disease of which we have heard a good deal, but which is not dangerous, should the flesh be properly roasted, fried or boiled. The germ of these animals lies in the flesh of the hog. Say in a square inch of ham there are no less than two hundred and fifty thousand of these germs, so that if a man eat four square inches of ham infested with this germ, he will have swallowed one million of this trichnea or hog worm. If the meat infected by the trichnea is saved meat, like dried ham that may be eaten raw, then the person eating of it will have swallowed the living germ, and the disease in that person may become apparent and very destructive. The next representation on the chart was a waterspout, which it was supposed had overthrown whole districts, cutting down trees and destroying animals, the remains of which are yet to be found. Having closed his history of the tertiary period, he now came to the ostrich—the largest of all the bird species—the bird, who, when "she lifteth herself on high," as Job says, "she scorneth the horse and his rider." In the island of Madagascar were known birds very much larger than the ostrich of the present day whose egg was thirteen and a half inches in length and four inches in diameter. He came next to animals that live on the surface of the sea, like whales and others. This species in the full grown state, are but embryonic of a higher state of life. The various animals, ranging from the lower order to the higher order were then described by representations on the chart and by the interesting descriptions of the lecturer, touching upon them in their order—the opossum of Virginia, the kangaroo of New Holland and others of the same species. After these came the armadillo, filling up a gap between the lower orders of animals and those of a higher state. The latter were represented in the later portion of the tertiary age. The lecturer then referred to another species of the tertiary age—animals called the tapirs, of Southern Asia and South America, though these animals, apparently alike in the two distant countries, were not altogether of a similar species. Cuvier reconstructed many of the animals that have passed away—reconstructed them by putting together the jaw bones and shoulder blades. This was all that was requisite to an anatomist in natural history. As an architect could tell by finding the capital or base of a Corinthian pillar that the ruin before him was formerly of Corinthian architecture, so could the naturalist tell from a few bones to what species defunct animals belonged.

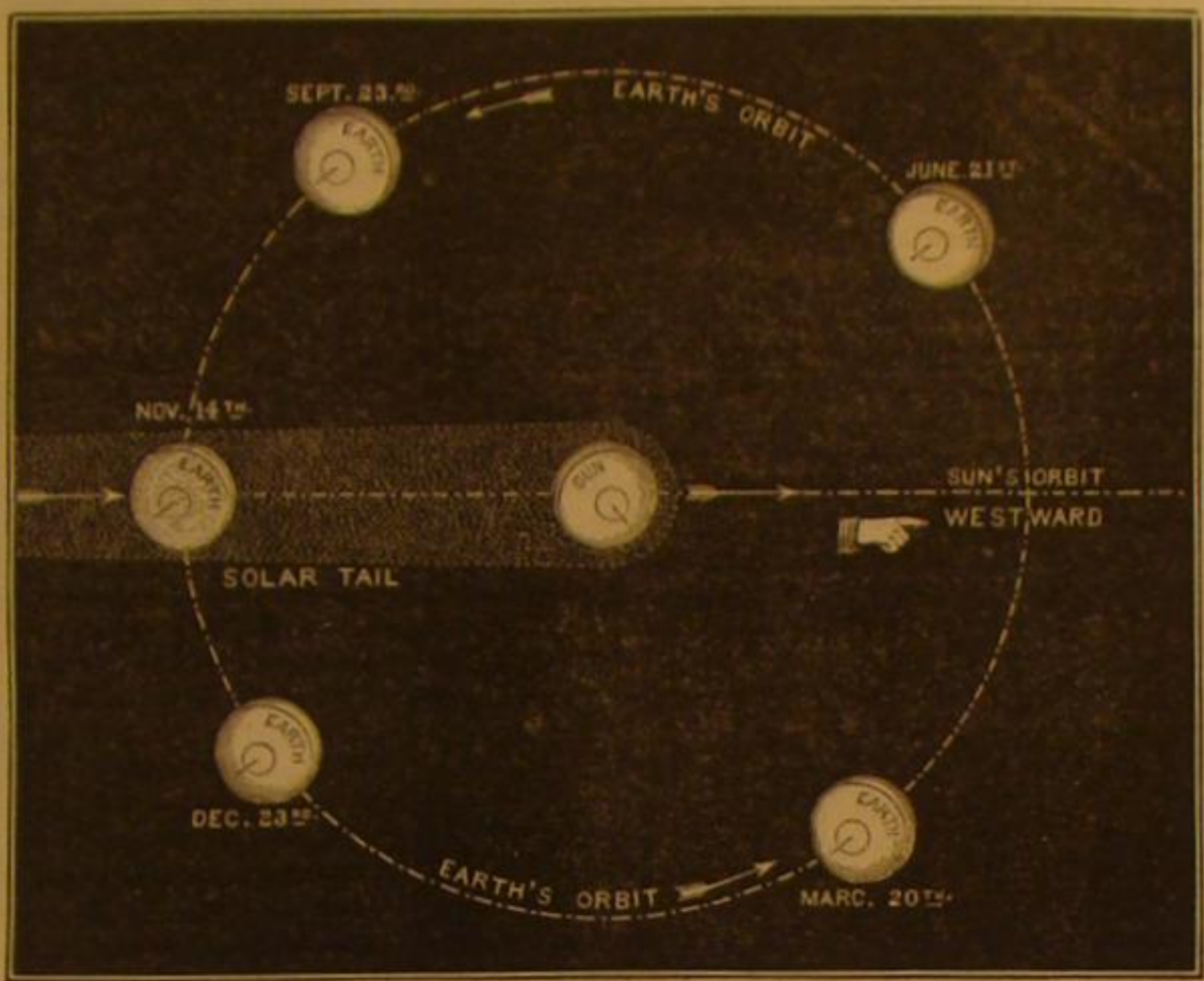
The next animal represented was the rhinoceros, which bore some resemblance to the larger reptile of another age. The reptile of which the rhinoceros was a certain type had also a horn. This was one of the larger reptiles. The lecturer then presented on his chart the cow, the lion, and finally man, the great and crowning work of the creation. On the chart were presented excellent life-like busts of the two candidates at the late election for the Presidency—Seymour and General Grant. After them came the White House, the goal to which they had, on different tracks, been aiming at, and after this came the Capitol. These representations were very fine and elicited the plaudits of the audience. The lecturer then closed and the audience then separated.

Correspondence.

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

The Origin of the Meteors.

MESSRS. EDITORS:—With your permission I will give you the outline of a theory upon the origin of meteors. I think I can show clearly and indisputably, the three following astronomic facts, namely: That the sun's orbit is westward; that that the sun has a long meteoric tail streaming many millions of miles behind it; and that the earth actually passes through the tail of the sun on the 14th of every November. These three most important facts will be better understood and more thoroughly demonstrated by the annexed diagram, which represents that, in March, the north pole of the sun is seen inclining toward the earth. (This is known to observers, who see the spots upon the sun's disk describing a curve convex to the south.) In June, its north pole is inclined to the left, and the spots are seen moving in straight lines, and inclining upward. In September the south pole of the sun is inclined toward the earth, and his spots are again seen to curve, but now concave to the south. In December his north pole is inclined to our right, and his spots are again seen to move in straight lines, but now inclining downward.



These facts are well known to all practical astronomers; and many astronomic writers represent the same by diagrams in their text-books; they will not, therefore, be denied or disputed.

It is also well known to all astronomers that there is seen at certain seasons of the year "a faint light, hardly distinguishable from ordinary twilight." Astronomic writers tell us "that it has the form of a pyramid;" of course they mean on both sides of the sun, because they immediately represent it by diagram on two sides of the sun, and say that "its major axis is at right angles with the axis of the sun." Hence the popular astronomic opinion or belief is, that said light (that is, the "zodiacal light") is on both sides, or rather, that it surrounds the equator of the sun; and while some have supposed it to be a "solar atmosphere," and others a "nebulous vapor," I feel inclined to dispute the point, and say that it is neither.

I hold that "the zodiacal light" is ever only on one side of the sun, and I feel quite prepared to prove the fact by the clearest and most incontestible evidence. Could the zodiacal light be seen evening and morning of the same day, then our astronomic friends would have somewhat to base their opinions upon; but, as the said light can only be seen after sundown at certain seasons of the year, and just before sunrise at certain other seasons, it is certain that the said light is not on two sides of, nor all around the equator of the sun.

This light, then, is, I say, a longitudinal appendage, or tail, if you will, resembling that of a comet, not nebulous or vapory, though apparently so, but purely meteoric, and similar to if not identically the same as that of the comet, which is no doubt meteoric.

If the zodiacal light surrounded the equator of the sun, it could be seen, less or more, almost every morning and evening of the year; but it is not, nor can it so be seen. It is seen only in the months of April and May after sunset, and in October and November before sunrise. Consequently it is only on one side of the sun, and that too on his hinder side, if I may be allowed the expression.

The length of the zodiacal light, as given by astronomers, is from 40 to 90 degrees, and estimating the length of this light in miles, we find by comparing it with the solar distance of Venus, that it cannot be much less than 130,000,000 miles. Its length is no doubt always about the same, but owing to the change of position of the earth, as it moves in its orbit around the sun, the zodiacal light apparently changes its position, appearing shorter or longer accordingly. Supposing 90 deg., then, to be the length of this solar tail, and about 46 deg. the astronomic distance of Venus from the sun; if 46 degrees gives 68,000,000 miles (which is Venus' distance from the sun), then 95,000,000 (i. e., the distance of the earth), will represent the earth when seen from any planet at right angles with the sun and earth, at about 63 deg., leaving a balance in favor of the length of the sun's tail of no less than 27 deg., or about 37,000,000 miles, at the lowest calculation.

Supposing the above to be positively true, it seems clear that the earth in moving around the sun must some time or other either pass through or by this tail; and meteorites from it (for it is a composite of nothing else, if the furnacal cinders and cratoric vomitings constantly and continuously thrown out by the ever-flaming sun are to be recognized as such), must fall upon the earth in great abundance at that particular point of her orbit; and that the earth comes to that particular point on the 14th of November, let the reader see and satisfy himself by a reference to the diagram.

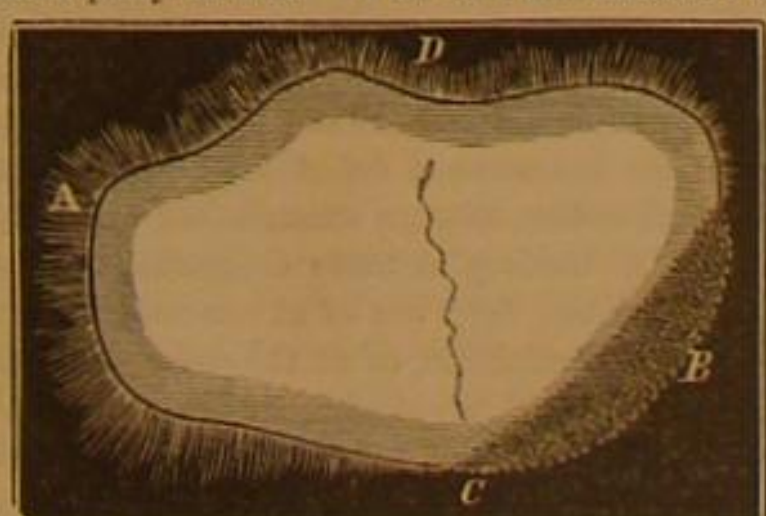
In conclusion, I believe that the sun has entered on his cometary career; that he is now positively a comet on a large scale; and that the last grand end of his illuminative existence will be spent in winding up his longitudinal orbits round some other sun or suns. (Let interested scientists speak out.)

JOHN HEPBURN.

Gloucester, N. J.

Expansion of Ice.

MESSRS. EDITORS:—In your paper of Nov. 11, (Vol. 19, No. 29) pages 313 and 314, in the article on the "Expansion of Ice," after reciting the experiments of Dr. Tyndall, and those that take a different view, you remark that you "are inclined to the opinion that ice does expand as the temperature diminishes." I think that view cannot be sustained. My opinion may not be correct, but it is based upon fifteen years of experience in this northern latitude. At the temperature of 39 deg. Fah. water is at its greatest density; diminish the temperature to 32 deg. and it becomes crystallized, during the process of crystallization it expands nearly one sixth part in volume. After it becomes solid it is governed by the same laws of expansion and contraction as other solids in all fluctuations of temperature below 32 deg. During the winter season in this region ice forms frequently to the depth of thirty-six inches on our lakes, bays, and rivers. In the fall when it has formed to the depth of a few inches and before it becomes covered with snow to protect it from sudden changes of temperature, its movements on a sheet of water from a quarter to a mile in width are very perceptible. Ice from eight to ten inches in thickness seems to be necessary to produce the results I have more particularly observed. Let the following diagram represent a lake of any size, say one mile in length, and suppose that it is covered with ice one foot thick and not covered with snow. Now we will suppose that we are having clear cold weather, as we frequently do have in December, and the thermometer indicates 25 deg. or 30 deg. at sundown, at which it commences rapidly to sink. With this diminution of temperature the ice on the lake commences to rumble like a distant train of cars, and not unfrequently like the firing of artillery.



If we examine the ice an hour or two after sundown, we will find that the ice is fractured in various directions and the cracks are open showing that it is contracted. Should the temperature continue to go down until the next morning this contraction continues until the cracks will be two or three inches in width, or would have been if the exposed water had not become frozen. If the minimum temperature should remain uniform for several hours, and very cold, these cracks become filled quite solid. Next morning the sun comes out warm. The temperature comes up rapidly from ten or fifteen degrees below zero to the freezing point. The lake commences to rumble again, and now we have a demonstration of power in proportion to the size of the lake and the thickness of the ice. We will suppose the shore of the lake is bounded by perpendicular cliffs at A, and that at the opposite end, at B, there is a sand beach. Now supposing that the cracks formed by contraction have become firmly frozen, it is plain proposition, that if there is any expansion that the ice must give way in the direction of the weakest point, which would be up the inclined beach of B. This is exactly what occurs, and the movement or sliding of the ice up the beach at B will be in proportion to the size of the lake. At the northeast of Mille Lac, Minnesota, in December 1858, the movement was at the rate of eighteen to twenty inches per day for several days in succession. That lake is about fifteen miles long by seven or eight wide, and is elevated about six hundred feet above Lake Superior, and the north end being situated like the coast at B in the accompanying engraving. The expansion on the whole distance would show itself on that point. If the ice is twelve inches thick, and the sand is frozen twelve inches deep near the water, away it goes up the incline, slowly but permanently enlarging the area of the lake, or forming considerable sand hills around the borders. If the shore consists of boulders and gravel, shoreward they must go and be piled up like an inclosing wall. These walls are frequently several feet in hight and have been attributed by some to human hands.

Not unfrequently the ice gives way across the middle of a lake in the direction of C D. If the point C D should offer less resistance than the shore, B, there will be no movement at B, but the crack will open every contraction, freeze, and thus become crushed with every expansion.

It strikes me it would be no difficult matter to measure the amount of expansion and contraction for every degree of change of temperature.

G. R. S.

Superior, Wis.

A Voice from St. Louis about Watches.

MESSRS. EDITORS:—A correspondent of the SCIENTIFIC AMERICAN, writing from Michigan, says he has had fifteen years' experience as a watchmaker, and yet is puzzled about a very simple matter connected with his business. I have worked on watches and clocks a period of fifty years, and have no objection to tell a thing or two which it seems all watchmakers don't know.

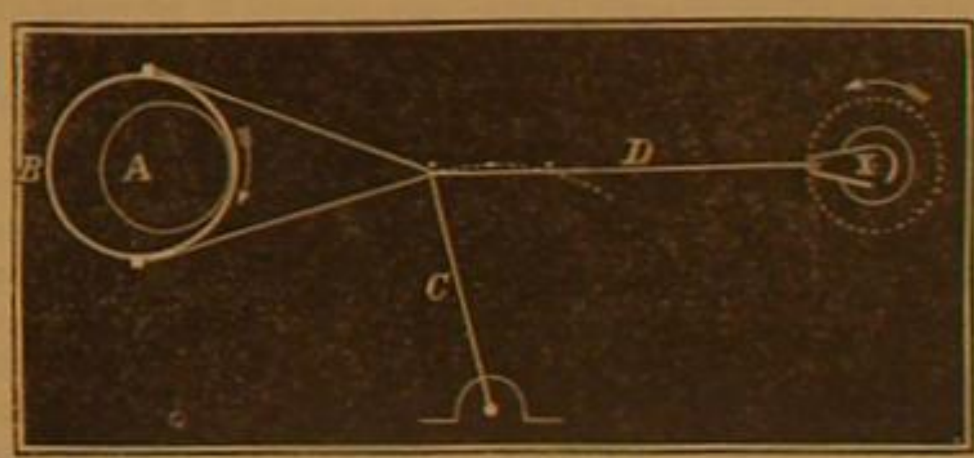
I could not help smiling when I read D. E. C.'s statement. My time has been greatly devoted to the causes of the stoppage of watches and the remedies for it. The taking to pieces and putting up again is a matter of great importance, and few who profess to be watchmakers know how to do it properly. Your Michigan correspondent says, "the lower center bearing under the canon pinion corroded or rusted" in from three to eight weeks after cleaning and oiling. Let the gentleman adopt this plan: When he cleans the watch, be particular to take the center wheel off, clean it thoroughly; if the pivot is scratched, polish it; then make a little hollow in the top hole; put good fresh oil (Ezra Kelly's) on it, and the pivot will not corrode or rust within two or three years. As to the other pivots in the watch, they should all be thoroughly cleaned, old oil cleaned out; then, if no dust gets in and no accident happens to the watch, it will run for years.

This statement may prove of interest to the "many watchmakers in the fog."

St. Louis, Mo. E. U. HUGUNIN.

Eccentric with Crank Combined.

MESSRS. EDITORS.—The enclosed diagram represents the eccentric and rods for moving the valves in a beam engine on the steamer *Keweenaw*, a moving palace on our river, and which I think is akin to John Allen's on page 20, Vol. XIX. and which Aberdeen, on page 69 same volume says won't work.



In the above, A is the main shaft, B is the eccentric, C is an oscillating fulcrum, D is the eccentric rod in two pieces jointed together at the point of meeting with the fulcrum. X is the crank on the small shaft on which are cams to work the valves. This appears to me to be connecting shafts by pitmans, except that an eccentric is substituted for the crank. Will you or your correspondent Aberdeen, please explain and oblige, D. A. MCCORMICK.

Detroit, Mich.

Temporary Newspaper Binder.

MESSRS. EDITORS.—I send you a copy of a device which may not be novel, but is certainly useful in fastening together newspaper files or as a sort of temporary binding for the SCIENTIFIC AMERICAN, or any loose sheets of paper. Take two

pieces of light wire long enough to reach across the paper once, and three or four pieces of stout thread; place one wire under the paper as far from the edge as you choose to bind it put the threads around the lower wire up through the paper, and tie them over the other wire on top and the deed is done.

A. JOHN.

[Temporary covers of stiff pasteboard, we think, might be added, having holes for the reception of the thread or twine.

the wires being placed on the outside of the covers. Of course, it is understood that the successive papers are to be threaded (by means of a coarse needle or awl) one by one.—EDS.

Steam Boiler Explosions.

MESSRS. EDITORS:—There have been various theories and opinions advanced in explanation of steam boiler explosions. Some of these may be sufficient to account for some explosions, but none of them account for all the explosions that have taken place. The only one that I ever read accounting for all was written by a lady (Miss Fanny Purves, of Philadelphia), and that stated that it was nothing more than over pressure; and she counseled, as a preventative, the use of pure tough iron in plates sufficiently thick to bear this over pressure. A question here arises—What causes this over pressure? Is it the indefinite expansion of steam, under a continuous increase of temperature? Such is held to be the case by some, but that is not sufficient, because there is a limit to that theory. Perkins has shown by experiment, that if you take an iron vessel and fill it with water, and heat it to a red heat, and then open a hole, no steam will escape while the vessel and water are at this high heat; but that as soon as the temperature goes down, the steam will escape with great force. We know that when water runs out of the tea-kettle on a hot stove, it will dance about in globules, generating no steam. This is termed the spheroidal state of water, but the intrinsic philosophy of this spheroidal condition is not fully understood. There appears to be a balance between expansion and contraction, or, attraction and repulsion, governed by some law not philosophically understood; and it appears to me that it is this condition of the water in the boiler that causes those terrific explosions that frequently occur. It is well known that when steam in the boiler acquires a high pressure, its augmentation of heat and pressure follows rapidly; and it will not take many minutes to put the water up to the spheroidal heat. The boiler will have to bear an undue strain before the water attains its spheroidal heat; and if it leaves it, will no doubt be impaired more or less, but will nevertheless hold in the spheroidal water; because in this condition it makes no steam, and consequently exerts no pressure. Now while in this condition, the great danger is pending, and of this the engineer is admonished by the following symptoms: The steam whistle when worked will squeak, and suck, and fret; the safety valve will chatter and work asthmatically, if you will allow me the term; and the only remedy that I can see is for all surrounding persons to flee the wrath to come. For as soon as the temperature goes down to the point at which the water gives up its spheroidal condition, and assumes that of high steam, there will be a sudden augmentation of steam and pressure greater than it was when it assumed the spheroidal form, and then follows that terrific explosion we too frequently hear of. I could cite a number of cases of boiler explosions corroborating this view of the matter. The opening of the safety valve by outside force lets in cold air by suction; for in the spheroidal condition of the water the boiler will suck, or inhale, instead of pressing outward or exhaling. And so with the steam whistle, it will wheeze, and suck, and fret, and chatter, giving warning that an unusual condition of things exists inside the boiler.

When we shall learn the electrical condition of the water in its spheroidal condition we may devise some means to avert the calamitous consequences of its changes in steam boilers; for in all the explosions that I have investigated, I found that anomalous condition of the safety valves, steam whistles, and gage cocks.

Professor Hare, of the University College at Philadelphia, made some experiments many years ago upon the quiescent condition of water in a red hot vessel; but could not arrive at any well-established conclusions. And now, since it is only a step from high steam to spheroidal water, and a back step from spheroidal water to higher steam, it seems to be a thing of too easy occurrence for destructive explosions, especially where small boilers are used for great powers—especially the tubular boilers. JOHN WISE.

Lancaster, Pa.

The Steam Engine Indicator.

MESSRS. EDITORS:—My attention has been called to a communication in your paper, on the above subject, from Mr. Charles T. Porter, which criticises some remarks of mine in the series of articles on, "Testing Steam Engines." Mr. Porter refers more particularly to what I said regarding the "Richards Indicator;" which is also called by some the "Porter Indicator," probably from some business connection Mr. P. has had with the instrument. His letter was evidently written after a hasty perusal of but a portion of my paper.

The experimental engineer is as much dependent upon his instruments, as the astronomer, the microscopist, or any other investigator; and no one can be more ready than myself to acknowledge the superiority of the instrument in question. Whether or not it gives more correct indications than the old style need not be discussed. At any rate the new instrument is far more convenient and largely reduces the labor in deciphering the diagrams. People will therefore give it the preference. I have shown in my paper that the indicator is the only instrument that it is practicable to use, in a majority of cases, to test the power of the steam engine, and have pointed out a defect common to both kinds of indicators; viz., that the instrument is tardy in recording the changes of pressure. The cause of this I explained, on page 308, in these words—"The moving parts must have weight and friction, and some force is necessarily required to overcome the latter and put the mass in motion," and these words are repeated, substantially, on page 322. Mr. Porter, probably through haste in reading the papers, has entirely omitted in his communication the subject of friction, and discusses only the inertia of the moving parts. Without reviewing his article critically, it is sufficient to observe that the discrepancies in the length of the ordinates show the force exerted to put the mass in motion and overcome the friction, and not the development of force into power, so the argument about the square of the velocity in no way applies to the case. But this point is of small importance, for the error due to weight of parts is in every case nearly balanced by the oscillations on both sides of the true line, and friction only prevents its being fully so. Friction, then, is the chief cause of the discrepancies. If the friction of the moving parts and pencil of the instrument be one pound per square inch, the piston will compress the spring one pound by the scale before the pencil will move at all, so that, during any change of pressure, the indicated line is separated from the true line a distance equal to the friction pressure. The friction of a good indicator is small but it is always something. If it be only one fourth of that of a good steam engine, working without a load—say one half of a pound to the square inch—this discrepancy repeated on the top and bottom of an indicator diagram would be ten per cent of a mean pressure of ten pounds or five per cent of a mean pressure of twenty pounds. However small the friction, it is absolutely impossible for the instrument to be exactly accurate, and experiment shows that the combined friction and inertia of the moving parts increase the discrepancies at high speeds. Notwithstanding this, the indicator is the best instrument we can use for the purpose, in ordinary practical trials. My only object in pointing out its faults was to show under what circumstances it can be depended upon. The particular example, illustrated on page 341, was selected because the difference is so extreme that it can be seen by the eye without measurement. Ordinarily the difference would be much less, as is there explained. [The last word of the explanatory note on page 341, should be "less," not "up" as the types have it.]

Whether or not my explanations are correct makes no difference. The question at issue is simply one of fact. If Mr. P. will spend fifteen minutes in trying the matter he will be satisfied. Honest differences of opinion tend to improvement, and are therefore commendable, but permit me to suggest that common courtesy between members of the same profession should require that statements of the results of actual experiments should not be denied too positively until disproved by the results of similar experiments made by persons of equal experience.

MESSRS. EDITORS.—On page 355, last volume, I am requested by "Engineer" "to state what we shall call the result we get by the indicator when we throw off all resistance and run the engine by itself alone?"

In answer to this I will say that had the gentleman read further, he would have found in my article on page 341, same volume, the answer to his question and a full discussion of the subject. He will there ascertain that the so-called friction diagram shows the friction due to the weight of the moving parts, which is constant at all loads, added to a large friction in the stuffing boxes which is reduced when the engine is loaded, and that it fails entirely to show the friction due to the load itself. CHARLES E. EMERY.

New York city.

The Steam Engine Indicator.

MESSRS EDITORS:—Since my letter was written which you have courteously printed in a late number, the diagrams on which Mr. Emery founds his judgment have appeared in your columns. We are shown two pairs of diagrams, one pair taken when the steam was admitted to the cylinder through five eighths, and the other when it was cut off at one fifth, of the stroke. The latter show a greater mean pressure than the former by 28·6 per cent, but we are assured that the power actually exerted by the engine was the same in each case, and that this "enormous difference" is wholly an error, arising from a defect of the indicator, a defect inherent and unavoidable, which has, therefore, always existed, but has only just been found out. On looking at these diagrams, we observe that, when the steam had been cut of at one-fifth of the stroke, the pressure at the termination, or at the point where the exhaust was opened, was considerably higher than it was at the same point when the steam had been permitted to follow through five-eighths of the stroke. Now everybody acquainted with this subject knows that the indicator never shows anything of this kind, but that, in all cases, if steam is admitted to the cylinder of a high-pressure, and is cut off early, a lower terminal pressure is shown than when steam of a low initial pressure is allowed to follow nearly to the end of the stroke, to do the same work. It is obvious that, instead of the resistance having been the same in the two cases, as represented, doubtless innocently enough, the engine was in fact exerting in the latter case 28·6 per cent. more power than in the former. The article shows sufficiently that a serious defect exists somewhere, but not in the indicator. CHAS. T. PORTER.

Rainfall---Steam Indicators.

MESSRS. EDITORS:—I notice in the SCIENTIFIC AMERICAN, Vol. XIX, page 346, an article on the annual rainfall in different portions of the earth, in which is the statement that "The amount of water contained in a given amount of air, is, all other things being equal, proportioned to its temperature." It has been ascertained that the amount of water contained in the air varies directly with the temperature, but not proportional. As the temperature of the air increases, its capacity for holding water increases, but in a much greater proportion, and at high temperatures a variation of one degree will increase its capacity several fold more than the same variation would at a low temperature. This is the cause of the large rainfalls in the tropics. For several weeks sometimes there is no rain, the temperature increases very much, and the air, to get saturated, absorbs nearly all the moisture, thus producing a drought. This continues until there is a fall in the temperature, when the water is liberated in very large quantities causing the heavy rains.

I have been deeply interested in your articles on the best modes of testing steam engines, but more especially on the use of the indicator. In my short experience I have found that the Richards indicator is very much valued by some engineers, and I have seen various kinds used, among them patent instruments for preventing or reducing the travel of the pencil above, with its attendant reaction below, what should be the recorded pressure of the steam on its first admission into the cylinder, but I have never found one that is so well suited to general use as the Richards. I have seen figures, taken by it from the engines of Penn & Mandslay, in steam launches, which run at the rate of from 400 to 420 revolutions per minute, and they have been invariably good and well defined. JOHN H. RICKARD.

Clifton Springs, N. Y.

[Our correspondent mistakes our meaning if he supposes we asserted the amount of water air contains is proportional to its temperature, all other things being equal. We said "proportioned," *vide* "Silliman's Physics," page 651, and Webster's Dictionary last definition of the verb "proportion."—EDS.

Setting up of Steam Engines.

MESSRS. EDITORS.—Allow me to make a few suggestions for your valuable consideration. I am by trade a machinist and have been a constant reader of your very excellent paper for a long time. Among my fellow craftsmen are many who can build, in the most thorough manner, any part of any engine made, but if called upon to set it up would not know how to do it; still some of these very men understand the principles of a high or low pressure engine and can give good explanation of the same. Of course much of this information is got from such works as King's, Bourne's, Murray's, etc., but I have never yet seen any work that explained how to line up and set for running an engine. Now, if you could, through the columns of your valuable paper, give the proper methods of setting up engines—stationary and marine—commencing with the common horizontal, showing or explaining the proper attachments to a boiler, etc., I think it would meet the wants of a large number of mechanics and increase the subscribers of the SCIENTIFIC AMERICAN. Also explain the governor and how to give the proper speed etc.; also the size of feed pipes, steam, and blow-off pipes. If you should deign to notice this letter and should give some notes on the steam engine, give us no algebraic signs, but plain figures, such as most all mechanics can understand; by so doing you will receive the thanks of at least that portion of hard fisted mechanics which I represent. H. M.

Charlestown, Mass.

[Our correspondent cherishes a delusion altogether too common, but one which we had supposed was confined to those who had no practical acquaintance with the building of steam engines; and that is that it is possible to derive this practical knowledge from books. The general principles of the action and construction of steam engines, a description of the details of any particular engine aided by drawings, and the relative proportion of parts may be given in this manner; but it would be as useless to attempt to give written instructions how to line up, and set up, and put in working order an engine *in situ* as to attempt to make an apprentice a good filer by that means. The books our correspondent refers to are among the best on the subject, but they are intended only as aids to a practical education. We have frequently given advice and directions in particular cases which were more or less applicable to other cases, and sometimes we have given the proportions of parts; but to descend to the minutiæ and to give exact rules to govern all cases is impossible. The setting up of boilers is a matter that may be thus illustrated with advantage. An article on that subject may be found in No. 9, of Vol. XVII, SCIENTIFIC AMERICAN.—EDS.

Low Steel---The Requirements of Ax Manufacturers.

MESSRS. EDITORS:—I have been very much interested in the articles that have appeared in your valuable paper from time to time on the manufacturing of steel. But it seems to me that the makers of steel in this country have not got the right idea of what is needed for the manufacture of axes. I have worked in one of the largest ax establishments in this country for fourteen years, and during that time the company have tried most of the kinds of steel made in this country, and have been obliged to reject them all; not because the steel was not good steel, but because it was not suitable for axes. And here is where American steel manufacturers make a great mistake in not making a lower tempered steel. When axes were forged by hand they were made very thick, and steel of a higher temper could be used; but now the consumer will not use them unless made very thin; and consequently the steel used must be of good tenacity to have them keep from breaking in frosty weather when they are most used. Long experience has convinced me that high-tempered steel, such as is used where a fine edge is only required, is not suitable for axes as they are now made. We have found this to be true of both English and American steel; and the English manufacturers have sent steel here which was condemned as poor, when the truth was it was too high tempered. But it worked well in tools where it was not so hard punished as it is in axes.

Now why cannot American steel manufacturers make low tempered tenacious steel as well as the English? There is a large demand for such kind of steel, as there is a large quantity used in this country; and the duty on English steel is so high that it is very desirable to have it made where the duty could be saved. It would make a difference of thirty dollars per day with the company that I work for if they could use the

American steel instead of the English. It will be at once seen that it is not prejudice that stands in the way, for interest and everything else is in favor of the American steel. And this ax company, as well as several others, have come to the conclusion that it is cheaper in the end to use the English steel, until the American manufacturers make steel that is suitable for their use. And I cannot see any reason why they cannot do it now as well as at any other time, if they rightly understood what was wanted. C. M.

East Douglass, Mass.

The Open Polar Sea.

MESSRS. EDITORS:—Having given some consideration to the Polar Sea for some years past, I read with some interest the article on page 281, last volume SCIENTIFIC AMERICAN. Inasmuch as there have been numerous theories respecting the open sea by some, and as its existence is wholly denied by others, I wish to make a few suggestions. It is rather difficult to indorse the idea that it is caused by the Gulf Stream as there indicated; for whether that stream be produced by the escape of the pent up waters of the Gulf, or the discharge of the river Amazon, or both combined, it would seem evident that the warm waters being at the surface would continue there, and keep an open communication to the pole, affording a passage to navigation.

That the Polar Sea is open hardly admits of a doubt; I should rather doubt how it could be otherwise. I believe it is conceded by all that the equatorial waters are raised several miles higher than the polar waters (that is their distance from the center of a true sphere), owing to the centrifugal force given by the rotation of the earth, and the action of the trade winds blowing constantly toward the equator. Now if this be so, the effect must be mostly at and near the surface; and if the surface waters are driven to the equator, their predecessors must be constantly giving place. And how can they escape except toward the bottom of the ocean, where the centrifugal force is less? If the pole is open, it must be kept so by water from a warmer region in submarine currents. And if from the equator, where tides rise highest (unsupported by local causes), may we not suppose that the pressure would produce some rising tide at the pole as a natural tendency of water striving for a level.

Braceville, Ohio. CALVIN STOWE.

[We fail to see how a uniform centrifugal force would have any tendency to produce currents in the ocean. Although it is plain that centrifugal force varies from the equator to the poles, it remains constant in any degree of latitude north or south. Water raised to any hight at the equator by this force would, if no other force acted upon it, remain there; the force which raised it being sufficient to keep it there. The other causes mentioned have plausibility.—EDS.

Professor Dussauce and M. Piesse.

MESSRS. EDITORS:—In the number of your journal for December 9, page 379, I noticed that your contributor, S. Piesse, L. C. S., asserts that, after buying "The Guide for the Perfumer," he was much chagrined to find it a reprint of his own book. This is a very grave assertion, coming from a man of M. Piesse's standing.

I have published several works, and have always been careful to give credit to whom credit was due; and if in this book M. Piesse has not been mentioned, it is for the very simple reason that I owe him nothing. "The Guide for the Perfumer," as its title page indicates, is a translation from the French books of Messrs. Debay and Lunel. If these chemists have borrowed from M. Piesse, I cannot be held responsible for it; and I cannot see why M. Piesse brings his reclamations three thousand miles across the Atlantic, where he could so readily take them to Paris where the authors reside; and M. Piesse, who has made a speciality of chemistry, applied to perfumery, cannot be without a knowledge of these works. Certain it is, Messrs. Editors, that a comparison of my book with those of Messrs. Debay and Lunel, will clearly demonstrate that neither the American author nor publisher has done injustice to M. Piesse. Trusting that you will give me the opportunity of publicly repelling this attack upon my character as an author, I remain yours, respectfully, H. DUSSAUCE.

New Lebanon, N. Y.

I have examined with considerable care the respective works of Professor Dussauce and M. Piesse, above referred to, and it seems that the difference in contents, arrangement, and general treatment of subjects is so great, that it would be difficult to find two books on the same subject much more unlike. In no respect do they seem to me to bear a resemblance to each other except in a limited number of the formulæ.

HENRY CAREY BAIRD,
Publisher of "The Guide for the Perfumer."

Philadelphia, Pa.

The Ice Wall About the Polar Sea.

MESSRS. EDITORS:—Are not the well-known walls of ice about the open Polar Sea necessarily formed from the motion given to the water of the ocean, by the centrifugal force generated from the daily revolution of the earth on its axis, and will not Mr. Hayes, or any other explorer, find those walls, from whatever direction he may attempt to reach the sea?

To explain: The motion of the earth at the equator produces a centrifugal force on the water of the ocean, which is to a great extent balanced by the power of gravitation. Consequently, at or near the equator, there is very little tide—say a foot or two. Half way from the equator to either pole, gravitation is at an acute angle of about forty-five degrees with centrifugal force. The tide, therefore, increases gradually in depth as far north as the Bristol Channel and the Bay of Fundy, and as far south as the Straits of Magellan, where the tide rises about thirty-six feet on the eastern side. At the poles, however, the centrifugal force is not counteracted by gravitation; the latter being at right angles with it. The weight of water in the ocean produces a side pressure, amounting to half a pound for each foot of depth. Of course, this water must be continually forced by the side pressure under the ice to the region of the poles, and there being acted on by centrifugal force, and effected by gravitation only so far as it is at right angles with it, the same water must rush outwards to the borders of the Polar Sea to form the well known barriers of ice. These barriers, therefore, appear to be a necessity, and must be found in all directions by those attempting to reach the Polar Sea in vessels.

Considering the expense of each new expedition, and the scientific interest of the subject, it would gratify many interested to have your views, or those of some of your able correspondents, through the columns of the SCIENTIFIC AMERICAN. HENRY N. STONE.

Boston, Mass.

Storing Power---Sand.

MESSRS. EDITORS.—In SCIENTIFIC AMERICAN, No. 24, Vol. XIX, your correspondent, "G," says: Give us a plan to bottle up power;" also, "Elevating water, is objectionable from its scarcity, great evaporation, and expense of reservoirs," and thinks concentration of air might possibly be "it."

No, sir! Too costly apparatus required, exceeding water works in this respect; will do very well for transportation of power through pipes, but not for storing it. Sand, sir, sand is what you want. Or gravel, dry dirt, finely broken stone, etc. Grain would answer very well, if always on hand in sufficient quantities, but would gradually wear out by friction, causing loss of weight. Water, wind, or other available or intermittent power can "elevate" sand as well as water. If it is scarce, there are substitutes. It does not evaporate and need not lose by leakage. Keep it dry and it will not freeze up the reservoir, nor machinery. Being heavier than water, would take up less room and would not be damp and disagreeable like water. By strengthening the supports, the loft or garret of a warehouse, mill, or factory can be used as a reservoir at little expense; or any natural elevation no matter how high, can be used, with a shed for protection against rain and snow. Elevators cost less than pumps and pipes; bins cost less than tanks. Equally as simple as the elevator may be the machinery for utilizing the power given by the sand in returning to its original level; may be an overshot wheel or elevator reversed. The whole can be made with but small expense for materials and would require but little skill to make or attend to it. It could neither burn nor drown people, nor explode; the "heft" of the sand being the only thing to provide for. It could be located wherever most convenient and with a sufficient altitude or head would require no great bulk of sand to run ordinary machinery, as an auxilliary power or regulator between gales even if not between freshets. Sand, I say sand!

W. L. DAVIS.

Louisville, Ky.

Meteorites---Old Theory the Best.

MESSRS. EDITORS:—A correspondent gives, page 353, a theory of meteorites founded on the assertion that the sun carries a tail of meteorites behind him, and that the earth on the 14th of November crosses this tail, by passing through the sun's path. That the sun, with all the planets, is moving through the heavens around the cluster of stars called the Pleiades, and at present in the direction of Hercules, is well established; but that the sun leaves a long tail or train behind him, is not only improbable, but sure not to be so. If such a tail in its path were the true cause of the meteorites, the sun must have two tails and two paths at least; as there is another date, August 10, where the earth passes through another orbit of meteorites, as is well known.

The old explanation of the veteran astronomer, Olbers, is perfectly sufficient to explain all periodical and non-periodical meteorites nightly seen in the heavens. It is founded on Kepler's old saying, that there are more comets and meteoric masses, revolving in the planetary space around one sun, than fishes in the ocean. Le Verrier, who proved by calculation the existence of an exterior planet before it was seen, has also proved in a similar way the existence of several belts where meteoric masses are more numerous, and which move in a certain circle, or rather ellipse, around the sun, in the same way as the asteroids (to the number of more than one hundred thus far discovered) but much smaller, and infinitely more numerous. Two of these belts intersect the earth's orbit at that place where she passes on the 10th of August and 14th of November, of each year. There are many more meteorites moving in the plan of the ecliptic, and more or less parallel to the earth; and among these the earth has, according to Olbers, in the course of ages, hollowed out for itself a kind of empty rut, attracting all within the reach of its gravitation. But as from time to time, by the periodical inequalities in its orbit, and the numberless perturbations to which it is subjected, it moves not exactly in the old rut, it will attract other meteoric masses, which thus far have escaped its attractive power. The moon, as she extends her course in a circle around the earth more than fifty of the earth's radii in diameter, will, of course, have a large share of the meteors it meets; coming so much further from the mean track of the rut, she also may send to us by her attraction some of the meteors she fails to attract to herself; all this explaining the nightly irregular meteors. Such a number of dark masses moving about in space may intercept a small portion of the light of certain stars, and thus explain some of the irregular periodicities observed in their degree of luminosity.

Allow me to observe here, that it always has struck me, when examining the moon by a powerful telescope, that she looks very much as if numerous masses had fallen on a soft, yielding surface, making a depression in the center, and turning up elevated circular edges around it. Some of these so-called volcanos may perhaps in reality have such a cosmical origin.

I close with the remark that the existence of the meteoric belts has been proved by calculation, and is an adopted "fact of astronomical science," which long ago was "carried to the eyes and ears of every scientific man," and that the theory of the existence of a tail which the sun carries behind him is simply an hypothesis, without the least foundation.

P. H. VANDER WEYDE, M. D.

New York city.

A Rule for Finding the Exact Length of the Circumference of any Circle.

Multiply the difference of the diameter and diagonal of a square of any dimensions by ten, and from the product subtract the diameter; the remainder is the length of the circumference of the largest circle which can be inscribed within the square.

How to construct a useful measure.—The rule being very brief is easily remembered and applied.

On a planed board draw a square six inches in diameter and through its center a diagonal line from corner to corner. Extend one side of the square in a straight line indefinitely, or about twenty inches. With dividers or compasses take the diameter and set it on the diagonal at one end, marking the distance. Now take the remainder of the diagonal line with the dividers, and walk them on the extended straight line, including the diameter of the square, ten steps. The distance outside the square is the length of the circumference of a circle of the diameter of six inches.

To apply this measure to circumferences of greater diameter, multiply it by the number of times six inches are contained in such diameter; if the given diameter is less, divide the measure accordingly.

Having deduced this rule from the principle demonstrated in the book published by me some months ago, I am willing that others enjoy its utility without paying the expense of a patented instrument, since every mechanic can make his own and can easily test its accuracy by trial.

CYRUS P. GROSVENOR.

McGrawville, N. Y.

School of Mines, Columbia College.

The School of Mines, Columbia College, proposes to establish, in connection with its metallurgical department, a bureau of statistics relating to the working of different ores in this country. It is proposed, with the aid of those engaged in manufactures of the different metals, to form at the School of Mines a bureau like the Bureau of Mineral Statistics connected with the Government School of Mines in London, with a view of having in this city as complete a collection as possible of the statistics of the manufacture of the metals in this country.

To this end a circular letter, being the first of a series to the masters of different establishments, has been issued, requesting the following items of information. As we believe the movement worthy of cordial support, we cheerfully make place for the circular in our columns, and urge those who can give the information desired, to coöperate and respond fully and promptly:

TABLE OF INFORMATION DESIRED.

Name of the Works; Town, County, State; Proprietors; Number of Furnaces; Total Hight; Hight of Bosh; Hight of the Hearth; Hight of the Tweers; Diameter of the Throat; Diameter of the Bosh; Diameter at the Tweers; Number of Tweers; Diameter of Tweers; Hot or Cold Blast; Temperature of the Blast; Pressure of the Blast; Kind of Ore; Yield of the Ore; Kind of Iron—White, Gray, Mottled; Kind of Fuel; Quantity of Fuel per ton of cast iron; Production of Each Furnace in tuns of 2,240 lbs., by 24 hours

Communications may be addressed to Thos. Egleston, Jr., Professor of Mineralogy and Metallurgy, School of Mines, Columbia College, corner of Forty-ninth street and Fourth avenue.

What Railroads do for Farmers.

To haul forty bushels of corn fifty miles on a wagon costs, says the *Agriculturist*, at least $12 for team, driver, and expenses. A railroad would transport it for $4 at most. Allowing an average of forty bushels per acre, the crop would be worth $8 more per acre, or 8 per cent on $100. As the relative advantage is about the same for other crops, it is clear that a railroad passing through a town would add $100 per acre to the value of the farms. A town ten miles square contains 64,000 acres. An increase of $100 per acre is equal to $6,400,000, or enough to build two hundred miles of railroad, even if it cost $12,000 per mile. But two hundred miles of road would extend through twenty towns ten miles square, and cost but $10 per acre if taxed upon the land. These figures are given merely as an illustration. If the farmers had taxed themselves to build all the railroads in this country, and given them away to any companies that would stock and run them, the present increased value of their land would have well repaid all the outlay.

The Sword-Hunters of Abyssinia.

Sir Samuel Baker, in his late work, "The Nile Tributaries of Abyssinia and the Sword-hunters of the Hamran Arabs," describes, as a new and curious fact, the mode of capturing elephants by the sword-hunters, who with great courage and skill cut through the sinews of the beasts hind legs, so that he falls to the earth and is then easily dispatched. Prof. Liebrecht, of Liège, shows that precisely the same thing is related of a people living in the same locality, by Agatharcides, a Greek geographer, who wrote a description of the Red Sea and its coasts, in the second century before the Christian Era. The work of Agatharcides is lost, but certain fragments of it, incorporated in the *Myriobiblon* of Photius, contain a description of the sword-hunters.

Improved Horse Hay Rake.

The teeth of this rake are of the usual curved form, each one set separately in the head and having a bearing against a spring, which insures independence of action and a ready adaptation of the rake to the inequalities of the surface. Horizontal guards, with downward inclining branches, project between the teeth to keep the hay from rising and to turn it more readily into windrows. The rake head is hinged so that it may be moved to raise or depress all the teeth together. They are depressed, when in operation, by the lever seen by the side of the driver in the engraving, and having a foot rest by which it may be moved. A powerful spring on the head keeps the teeth from the ground when not in operation, so that the rake may be used as a vehicle on the road to and from the field. But for convenience in transporting it a long distance or for storing, it is constructed so that it may be taken in pieces in a moment and as readily put together again. This will be recognized by farmers as a valuable advantage. It appears to excellently well adapted to its purpose, its parts being few and easily made.

Patented May 1st, 1866, by Adam R. Reese, who may be addressed for rights and machines at Phillipsburg, N. J. See advertisement on another page.

REESE'S PATENT HORSE HAY RAKE.

Mica.

An esteemed correspondent gives the following: "Base-burning coal stoves are now all the rage, and the illuminating part of them is what takes. So many of this kind of stoves are now being made that the question of clear white mica for this purpose is becoming important. There are hundreds of different inferior grades of mica. "Canada Mica" is of several different shades, from the light brown to the intensely black. New York gives us a very good mica, but no mica can be had equal to that found in the Eastern States. The demand has been so great for the past two or three years that the supply from the Eastern States has been exhausted, at least the mines at present open; what further development can be made remains to be seen. Mica has been so scarce during the past season that it has commanded the most unheard of prices. Six dollars being a common rate per pound and some qualities selling as high as twelve dollars per pound."

AN APPEAL FOR HELP—THE CHILDREN'S AID SOCIETY.

New York absorbed for the most part in money-getting has a good heart in the main. Many a man who will not yield a a hairsbreadth in a matter of business, is in private a large disburser of money for charitable and humane purposes. And not only in private but public charities, New Yorkers are always ready to give cheerfully.

Among the many institutions for the amelioration of the poor and distressed thus supported, there is not one more deserving than the one whose name heads this article. In a circular just issued by this society, an appeal for help is made to children throughout the land, as well as adults, for aid to carry on its work of mercy.

The object of this society is to provide food, shelter, and eventually comfortable homes for the poor little homeless wanderers of New York. That the public may realize the magnitude of the work done by this society during the past year, we append the following extract from the circular referred to: "In its five lodging houses for boys and girls are sheltered, partly fed, and clothed, during the year, about 10,461 different boys and 1,283 girls; number of meals provided in 1867–1868, 151,448, and of lodgings, 107,790. Of the boys over 7,000 were orphans. In its twenty industrial schools were 5,609 different children during the year; about 287,000 meals were given and over 6,500 garments; some $8,000 were spent for bread. During the past year 2,286 persons, mostly children, were provided with homes and employment in the country.

No one who has not seen the filth and slum of the alleys and cellars of this city, the only homes, if any, possessed by the children above provided for, can estimate the mercy of removing 2,286 of these little waifs from these physical and moral hells of filth and vice to the paradise of pure country air and morals.

This is a charity to which all may contribute, except those in actual want. The secretary in his appeal says, "If you have nothing better, we should be glad even of your old clothes to make some poor shivering child warm." Boxes of old clothing can be collected in rural districts and forwarded to the office of the society whose address is given below. It is estimated that it costs twenty dollars to provide a child with a permanent home, and for this purpose as well as the support of the other features of the charity money is needed. The secretary says: "Our work has increased beyond our means; and the 'News Boys' Building Fund' has probably withdrawn some of our largest subscriptions from the current work of the Society. Unless generous donations are made, we shall be obliged to close some of our lodging houses in this inclement season, and suspend or limit our parties to the West."

We sincerely trust that such contraction of the usefulness of this society may not become necessary. Will not the friends of humanity remember during this blessed holiday season those "little ones" and those who are so nobly devoting themselves to their welfare and salvation?

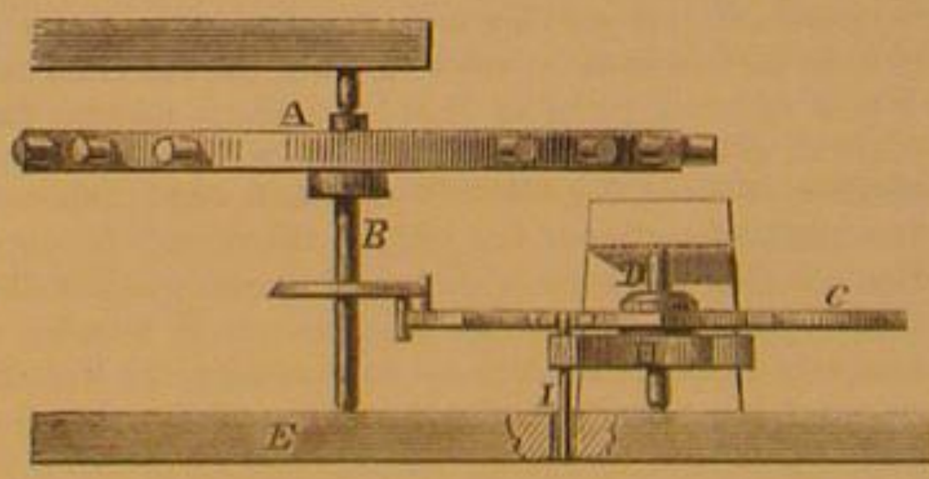
All gifts my be sent to C. L. Brace, Secretary of the Children's Aid Society, No. 8 East Fourth street, near Broadway, New York city.

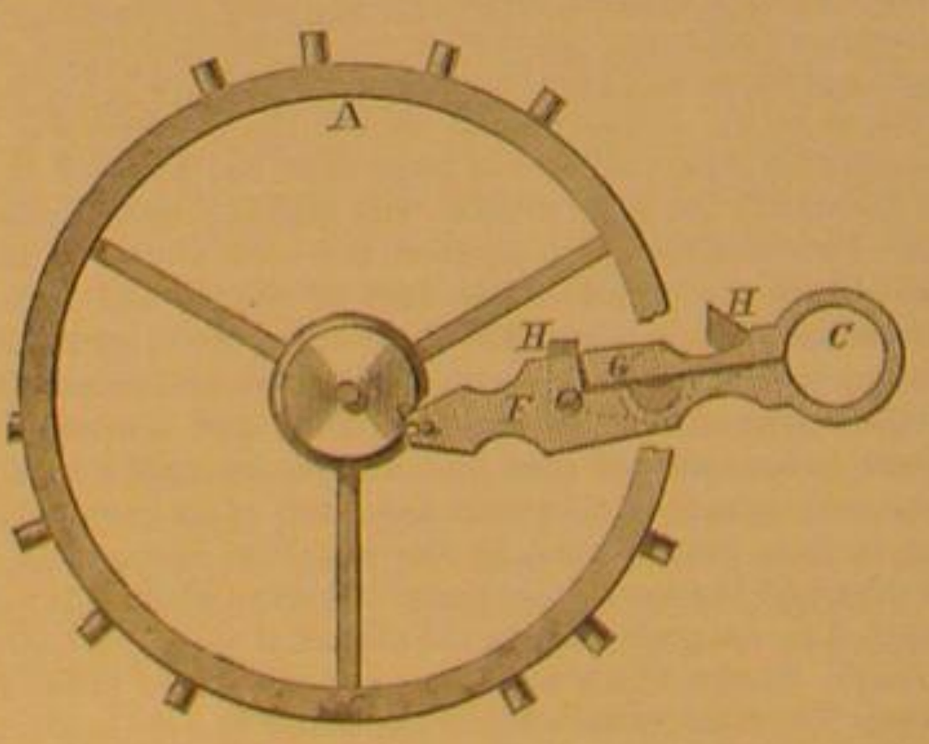
Protection of Sheep from Dogs.

A correspondent alluding to our article on this subject published on page 389, Vol. XIX, says that his father, a prominent sheep raiser, finding that the "bell wether" was never attacked by dogs, conceived the idea that the use of bells would tend to frighten away the murderous canines. Accordingly he furnished fifteen or twenty sheep of a flock of a hundred with globular bells, the size of an ordinary teacup. Having seen it practiced for several years successfully our correspondent is certain of its value.

HIETEL AND GEISSLER'S IMPROVED WATCH ESCAPEMENT.

The design of the invention illustrated in the accompanying engravings is to prevent the breaking of the ruby pin or pivots of watch escapements, when subjected to violent shaking or jarring, and to combine, in a simple form, the advantages of the lever and anchor escapements with the perfection of the chronometer movement.





The anchor escapement is found to be, when properly constructed, but little inferior to the free escapement in keeping correct time, and in durability it frequently excels the too complicated lock-spring escapement. But this latter has the decided advantage of allowing unrestricted freedom of motion to the balance, which is not the case with the lever escapement, as the latter causes occasional breaking of the ruby pin or the pivots. When exposed to sudden or violent motion, as when carried by engineers, conductors, and other employés on railroad trains, watches frequently become disordered, because the amount of play allowed to the balance of the lever escapement is insufficient.

A removal of these drawbacks to the lever would soon find favor not only among the owners of watches, but among watch makers and repairers. This is believed to be effected by the self-correcting spring lever herewith described. It allows the balance to turn freely in either direction, the lever yielding to its motion, but instantly regaining its normal position. It can be applied to all kind of American and foreign lever watches.

A, is the balance mounted on the staff, B; C, the lever vibrating on its staff, D; E being the plate or base. The lever is a spring bar, the spring being the ring at its outer end. It has two arms; one, F, long, and the other, G, short. The long arm fits half way around the staff, D, and the short arm rests against the flattened side of the staff, as seen plainly at G. This flattened portion is slightly hollowed, so that the arm rests against these two extreme points. H are the pallets, mounted on the staff, D, and I is the banking pin, one end passing through a slot in the long arm of the lever, and the other end playing in a groove in the plate, E. The lever and pallets work under ordinary circumstances, exactly like the ordinary lever. When, however, the watch is vehemently shaken so that the balance has a tendency to swing too far in either direction, the ruby pin will, when it has brought the lever to one side so that the banking pin is at the end of its slot in the plate, E, push the long arm F, of the lever still further in such direction; the spring of the lever allowing the arm to yield, thereby permitting the ruby pin to pass the lever, when the lever resumes its original position. Thus the action of the spring lever and the over action of the balance, caused by sudden disturbances, have the effect to equalize the motion and distribute the result of the disturbance; the overstrain of the spring tending to retard the too rapid movement of the balance, and also the rapid motion of the balance tending to a rectification of the position of the lever. The advantages of the device will be apparant to watchmakers.

Patented through the Scientific American Patent Agency, and also in England and France, Nov. 17, 1868, by J. Hietel, J. W. Hietel and J. Geissler. Address Hietel Bros. 327 South 3d street, Philadelphia, Pa.

WHY NOT GROW OUR OWN SILK?

With the stimulus given to American silk manufacture, by the present tariff on silk goods, this industry is assuming unprecedented proportions in the United States. The bulk of all the raw silk used in American silk mills, is imported. Is there any good reason why this should be so? Why should we not ourselves grow all the silk required.

The attempts hitherto made at silk growing in the United States indicate the possibility of its success in many sections. It was successfully grown in South Carolina as early as 1755, in which year Mrs. Pinckney, mother of General Pinckney of revolutionary fame, took to England a quantity of silk grown and spun in that State. Governor N. Johnson cultivated silk successfully as early as 1693. Experiments in the culture of this product in the Carolinas, made at intervals since the above dates, have uniformly been successful; but the cultivation of cotton has so absorbed the attention of Southern agriculturalists, that but little attention has been attracted to results of experiments in silk culture.

Silk growing in Connecticut dates back to a very early period. Governor Law wore in 1747 the first silk coat and stockings produced in that colony. President Stiles of Yale College, took a great interest in the pursuit, for forty years, and the college library contains a manuscript journal of his observations during that period. In Dr. Franklin's time silk was cultivated at Philadelphia. It is recorded that Mrs. Susannah Wright of Columbia, Lancaster, Co. Pa., received in 1771 a premium for a piece of silk sixty yards long, made from cocoons of her own raising, and used for a court dress for the queen of Great Britain. Specimens of this silk are still preserved.

In the more northernly portions of the union, silk growing has not proved very successful, owing to the severity of the climate. The attempts to grow silk in this State some twenty or more years since were failures, probably from this cause. But the southern and middle portions of the country, as well as the greater portions of the Pacific slope, are admirably adapted to this pursuit. California in particular, has advantages for this industry excelled by few localities on the globe.

The present condition of the silk industry in the latter State, is very prosperous, it is estimated that it has increased one fourth during the past year. There are now five millions of mulberry trees under cultivation in that State; two crops of cocoons in a season being the usual production, although three are sometimes obtained. It is also estimated that ten millions of sound cocoons will be the product of 1869. This represents thirty thousand pounds of fiber, produced at a cost twenty-five per cent less than the same quality of silk can be imported.

The conclusions from these facts are unmistakable. Silk manufacturing and silk growing in this country are at last permanent and profitable industries, and will remain so unless destroyed by a false policy on the part of the general government.

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VOL. XX., No. 2....[NEW SERIES.]....*Twenty-fourth Year.*

NEW YORK, SATURDAY, JANUARY 9, 1869.

Contents:

(Illustrated articles are marked with an asterisk.)

INFLUENCE OF VEGETATION UPON THE EXISTENCE OF MIASMS IN THE ATMOSPHERE.

We notice, in an exchange, a statement that a Belgian farmer, residing in a very unhealthy district, has changed his plantation—notoriously insalubrious hitherto—into a perfectly healthy one, by planting sunflowers upon it. Allusion is also made to the practice of the negroes in the Southern States who, to prevent certain local diseases, plant sunflowers and castor beans about their cabins. It states also, upon the authority of travelers in India, that the inhabitants of the marsh counties there, plant the betel pepper around their dwellings, in part for a similar purpose.

We are told, in this sapient article, that investigations following the Belgian experiment, discovered the fact that the sunflower derives the most of its substance from the air and not from the soil; as though that were a new discovery, and that all plants did not, to a greater or less degree, do the same thing. Thereupon the author congratulates himself and the world, that by a proper selection of plants, we may, at the same time we enrich our store, render whole malarial districts healthy. It would, indeed, be a subject of congratulation, if we could, by cultivating castor beans, rhubarb, and the other medicinal though mostly disagreeable plants to tongue and nose, in common use about our houses, avoid the necessity of taking them into our stomachs. But, we fear that the latter alternative will be sometimes necessary, so long as we continue intemperate in eating and drinking, and do not correct our habits in regard to air and exercise. As to the avoidance of pestilence and malarial influences by the cultivation of one kind of plant more than another, we believe that it is a superstition of barbarians, without the shadow of foundation. The stuffed skins of animals, the teeth of snakes, and other things have been believed by savage nations to possess similar virtues

Recent investigations all tend to establish the fact that so-called miasms are nothing more nor less than microscopic organisms, diffused through the atmosphere; living things, not gases to be absorbed by plants, as the article alluded to would have us suppose; incapable of being assimilated to the economy of a living being, be it plant or animal, and, on this account, a poison when introduced into the system. The conditions favorable to the growth and reproduction of these minute organic bodies, vary with temperature, moisture, and, probably, many other causes not yet understood. But it is specially noted that in low, swampy lands covered with dense rank vegetation, they are more numerous than in localities of opposite character. Such lands, favorable to rank growth, also favor swift decay, and the decay of vegetable matter, as well as animal matter, seems to develop a condition, among other things, favorable to the growth of miasmatic organisms. The clearing up and draining of swamp lands generally end the career of fever and ague in their immediate vicinity; for this reason, and not to the agency of any cultivated crop, as suggested in the article referred to, has the health of those localities improved.

We are willing to concede with Falstaff, that "instinct is a great matter." We do not believe, however, that the negroes, the East Indians, or even the Belgian farmer, have been guided by instinct or by reason, to the selection of a plant that is so potent in its influence upon malaria; and, in the absence of any information as to the nature of the miasm which has disappeared from the once infected plantation, and without knowing any of the collateral circumstances of this case, we prefer to believe that it was owing to some other cause than the presence of the "helianthus annuus."

FREEZING OF SUBMARINE WATER PIPES---PUMPING LONG DISTANCES.

From Mystic Bridge, Conn., we have received a communication in which the writer sets forth two grievances, the subjects of which are stated in the above caption. He says: "We have got a pipe in this place which supplies some of our people with water. Its head is fifty-six feet above tide water and it crosses the river (salt water) in a three-inch iron pipe. This pipe froze up solid and burst in several places while twelve feet under water. Some tell me it is *anchor ice*, but this I cannot believe."

In reply to this portion of the letter we would say that this case is not a singular one. The Croton Water Works managers have experienced the same difficulty in conveying fresh water across the East River at a depth of thirty feet. Salt water requires a lower temperature than fresh for freezing. Fresh water entering a pipe at a temperature nearly freezing and passing through a body of chilled salt water would be apt to part with enough of its caloric to form crystals or *spicula* of anchor frost against the sides of the pipe, and the formation of anchor ice would be very rapid. In the East River there is a strong current, as there probably is at Mystic Bridge, and as the lower stratum must, of course, be the coldest, the result of freezing is natural. The remedy is to encase the sub marine pipe in a non-conducting material.

The second difficulty found by our correspondent is in pumping water through 3,000 feet of pipe by means of a lifting or "suction" pump. He says: "The difference in hight between the supply end and the discharge end of the pipe is sixteen feet. The pipe conforms to the inequalities of the ground, being in some places high and in others low. I have attached a pair of good seven-inch lifting pumps and put a vacuum gage within ten feet of the pump which held it at 28 inches or 14 pounds. I filled the pipe the whole length with water and uncovered the high parts and let the air out previous to the filling. Yet I cannot get a stream. When the solid water came I plugged up the air holes, but with this 28-inch vacuum I could not hold the water. The supply end of the pipe has a foot valve."

Neither is this case remarkable. Engineers have often experienced similar difficulties. It is almost impossible to exhaust the air from the bends of a pipe when it rises from a horizontal. This case may be stated thus: 28-inch vacuum—14 lbs. 16 feet to rise—8 lbs., and 14—8—6 lbs. Now the air in the pipe forced out a portion of the water until its pressure was reduced to that of the column. Then the weight of the foot valve, whatever that may be, must be added to the resistance. Very likely the removal of this valve (which, after all, is an unnecessary adjunct), will reduce the resistance and remove the difficulty. If that is ineffectual, use a force pump at the point of supply instead of a lifting pump at the place of delivery.

POLISHED STEEL ORNAMENTS---BERLIN CAST IRON.

The material and style of ornamental articles of wearing apparel change in fashion from time to time. Now the material must be of the most costly character and elaborate design; again it is of the cheapest. Among this latter may be classed the so-called steel ornaments—buttons, ear drops, brooches, bracelets, clasps, etc.—lately and even now all the rage. Yet even this material, cheap as it is, is not what these articles are composed of; they are either cast or wrought iron, mainly of cast iron. The Berlin castings have long been celebrated for their delicacy and finish. One knows not which most to admire, the elegance of the finished work, the intricacy of the pattern and the consequent skill of the molder, or the fine quality of the metal that may be induced to assume such elaborate and intricate forms. Some of the articles, as brooches, have a beauty of network almost rivaling Italian filligree in gold, yet it is nothing but cast iron. The polish is perfect, and, unlike either gold or silver, it is not easily tarnished, even when exposed to the action of the carbonic acid of a crowded, ill-ventilated room. The luster has not the trying yellow or orange of gold, nor the glaring white of silver, but a clear, bluish, almost transparent sheen from which the light is reflected as from the diamond. And when cut into facets, as are some of the ornamental buttons for ladies' dresses, they rival the sparkle of the brilliant. The polish is obtained by the use of crocus on a buff wheel.

Berlin iron is also largely employed in casting statuettes, electroplated or lacquered to resemble bronzes, for which they are frequently sold, and to which they are nowise inferior, except in the intrinsic value of the material, as the peculiarity of the iron used is its capacity for easy flowing when in a fused state and thus filling perfectly the most minute portions of a mold.

IMPORTANT TRADE MARK CASE.

A case was recently decided in the Court of Common Pleas in this city, involving a nice question of the right to use certain well known words to designate a particular manufacture. It appears that Charles M. Town has put upon the market an article which he calls "Desiccated Codfish," which means "dried codfish."

Mr. Town brought a suit against James A. Stetson & Co. for using the same words upon their own manufacture. Judge Barrett decided that the popular word "desiccated," here sought to be burdened with a new and exclusive use, is specially descriptive of the article sold; in fact, it is the only word which correctly describes the process whereby this particular preparation of codfish is produced. No manufacturer can acquire a special property in an ordinary term or expression, the use of which as an entirety is essential to the correct and truthful designation of a particular article or compound. The court will neither prevent people from calling things by their right names nor force a misnomer upon them. The plaintiff may distinguish his "desiccated codfish" as the "Bismarck" or the "Von Beust," or by the prefix of any other proper name or common word not previously applied in that connection, and not essential to the truthful designation of the article produced, and he will be protected in its exclusive use. But he can no more acquire a special property in the word desiccated, as applicable to an article which has undergone that process than he can to the words "dried," "preserved," or "pickled," as applied to that which has, in fact, been thus treated.

This decision of Judge Barrett appears to be based upon good sound sense. Patents can be obtained for ornamented trade marks, but the use of fancy words to designate an article of manufacture will not, it seems to us, confer an exclusive right until the article has acquired a good reputation.

THE HUMAN WHEEL AND ITS RIVAL---THE VELOCIPEDE MANIA.

Dr. Oliver Wendell Holmes, in a former number of the *Atlantic Monthly*, published an article entitled, "The Human Wheel, its Spokes and Felloes," in which he treated the act of walking as analogous to the movement of a wheel; the legs being the spokes, and the feet the felloes. Had he postponed that humorous and instructive essay a year or two, he would have found himself behind the age. The art of walking is becoming obsolete. It is true that a few, like Weston, who still cling to that mode of locomotion, are still admired as fossil specimens of an extinct race of pedestrians; but for the majority of civilized humanity, walking is on its last legs. What with our steamboats, railway cars, horse cars, omnibuses, and last, and least in size though not least in importance, velocipedes, to which category will soon no doubt be added flying machines. We shall soon ride, sail, swim, or fly, wherever we wish to go; we shall have ceased to walk entirely.

We have land velocipedes, and water velocipedes; we still lack velocipedes for ice and air navigation. We have velocipedes with two wheels, and others with three, and even with four wheels; but the two-wheeled machines seem to be the ones most in favor. It might seem difficult at first to learn the manipulation of the two-wheeled species, but it is not so. We have seen them bearing, easily and pleasantly, young and old, light and heavy, with equal facility. Velocipedestrianism, a word coined for the times, is easier to learn than skating; and is fully equal to the latter delightful sport in its invigorating and exhilarating effects.

We lately witnessed an exciting race between a somewhat obese gentleman on the shady side of forty, and a slender boy of perhaps seventeen years, who, notwithstanding the descending ground was in favor of the heavy weight, succeeded in beating his more muscular rival by several lengths.

In Paris we learn that the number of these little vehicles has increased so much, that they are required to carry lamps in the evening. In this city, although we have heard of no police regulation requiring it, young gentlemen may be seen almost every night riding their velocipedes on some of our avenues, with head lights attached.

We have also schools for exhibition and instruction. One is announced in another column; another, recently opened, is conducted by Pearsall Brothers, No. 932 Broadway, where on any week-day evening may be seen upward of a hundred and fifty gentlemen—doctors, bankers, merchants, and representatives from almost every profession—engaged in this training school preparatory to making their appearance upon the public streets and fashionable promenades. Some of them become tolerably expert operators in a single evening; others make awkward work of it even after several nights' hard tugging. We frequently drop into this *Velocinasium* to witness the novel amusement which the exhibition always affords. Here are two well-known stock brokers, jaded by the excitement of Wall street, with their coats off, and faces burning with zeal, gyrating around the room in the most eccentric manner. Some of the time they were upright in the saddle, but more frequently they were engaged in mounting and dismounting their refractory steeds: they looked fatigued, they gave forth the sigh of discouragement; but after an expert had mounted and raced gracefully around the room, they began to rally for another effort, and seemed to be satisfied that the fault was not in the machine after all. We believe the young brokers have since become skillful operators. The large room is devoted to the instruction of new beginners, who, when they show sufficient skill, are promoted to the arena where their friends can witness and applaud their skill.

We are informed that a gentleman, in New Jersey, lately traveled fifty miles on a velocipede in four and a half hours. They are coming rapidly into demand all over the country There is a great call for improvement in these vehicles, by which their weight can be reduced, and their speed increased.

We expect some ingenious inventor will soon bring out a velocipede upon which our ladies will be able to take their airings, and that, too, without the necessity of any considerable change in the present style of dress. The panier now so generally worn will serve to cushion the seat, and by the introduction of a shorter dress, with flowing pants, which our ladies, who wish to enjoy robust exercise, may safely adopt, we may expect to see parties of both sexes making their morning visits to the Park mounted upon graceful velocipedes. There is evidently to be a good deal of fun and excitement on this subject when spring opens.

Harper's Weekly, in its editorial remarks, after copying from this paper, on this subject, says:

A number of persons in this city and its vicinity are already making use of the velocipede as a means of traversing the distance from their homes to and from their places of business. One gentleman takes his ride of nearly ten miles daily, and saves time as well as enjoying the ride. The Rev. Henry Ward Beecher has secured two of the American machines, and other gentlemen, well known in the literary and artistic world, are possessed of their magic circles.

Youngsters ride down Fifth avenue with their school books strapped in front of their velocipedes, and expert riders cause crowds of spectators to visit the public squares, which afford excellent tracks for the light wheels to move swiftly over.

The best speed thus far attained is a mile in a few seconds less than four minutes. In Paris the Americans carried off the prizes, as well for slow as fast riding. The slow riding is much the most difficult, as it is far easier for the rider to keep his equilibrium in a rapid ride than while moving slowly—just as in the case of a boy driving his hoop, the faster it goes the more direct is its line. To ride a velocipede well is much less difficult than to learn to skate, and the danger of a fall is not imminent. The present scale of prices demanded by dealers is about the same, ranging from sixty to one hundred dollars.

A horse costs more, and will eat, kick, and die; and you can not stable him under your bed," remarked an expert rider to a friend.

The weight of a medium-sized velocipede is about sixty pounds, and the size of driving wheel most in favor from 30 to 36 inches in diameter. The springs of the vehicle are so arranged as to make it ride easily over a tolerably rough pavement. A fair country road is as good a track as one could desire; but hills of more than one foot ascent in twenty can not be climbed without dismounting and leading the machine.

The winter season is not favorable to *veloce*-riding, but with opening of spring we may expect to see the two-wheeled affairs gliding gracefully about the streets and whizzing swiftly through the smooth roads of the Park.

We are desirous of making this paper foremost in disseminating information on this popular subject. The facts and incidents connected with this new species of locomotion will be read with interest by all, old and young, male and female.

REMINISCENCES OF TRAVEL IN SPAIN.

NO. IV.

THE MADRID PICTURE GALLERY—SPANISH ARTISTS—A VISIT TO TOLEDO, THE POMPEII OF SPAIN.

It is not generally known that the Royal Gallery of Madrid embraces the finest collection of pictures in Europe—a statement which may appear somewhat extravagant to those who have reveled amid the gems of the Louvre, the Dresden, and the Florence galleries. The assertion, however, is supported by some of the most intelligent travelers and critics who have closely studied the fine arts in all the chief centers of art in Europe.

The collection, which numbers about two thousand, consists not in a chronological series of Spanish pictures merely, but of gems by all the best-known masters of the French, Flemish, and Italian schools, to which is added the only good collection of the great Spanish masters to be found in the world. Spain had but one period of art, and a truly glorious one it was, that brought out such great painters as Murillo, Velasquez, Ribera, Alonzo Cano, Zurburan, Juanes, Morales, Coello, and Tobar, masters respecting whom very little is known out of Spain, and can be appreciated only by those who have studied their works. Velasquez was probably the most powerful historical painter that ever lived. He had a style peculiarly his own, and although he studied art in Italy, nothing could change the style which he had adopted, and certainly none other could so graphically portray the cold, haughty, lock-jaw looking figures of the royal subjects which chiefly employed his pencil.

Velasquez was a court favorite, and enjoyed unusual advantages, which he knew how to improve, and one cannot look at his stately figures without feeling that they could speak if they would. His picture of the surrender of Breda to General Spinola is perhaps the finest historical picture in existence. Velasquez rarely ever touched other than historical subjects, yet it would be impossible to forget a remarkable Crucifixion in this gallery, painted by him. Velasquez was employed by Philip the Fourth to paint a picture of the Infanta Margarita surrounded by her favorites, which included his own full-length portrait. Upon its completion he asked his royal master "if there was nothing wanted." "One thing only," said Philip, and taking the brush, he painted with his own hand, on the breast of the artist, the red cross of the order of Santiago, the highest honor he could bestow. There are sixty-four of Velasquez' superb pictures in this gallery.

The Spaniards take most pride in Murillo; they declare that he was never out of Spain, and that he acquired all his skill in the midst of his own people. Murillo's greater works are only to be seen in Madrid and Seville, and the fact that they usually embodied some religious sentiment, some mystery of faith which warmed the fervid impulse of the people, will explain in part the homage which his name and genius inspires. Murillo critically studied nature as he found it in the streets of his native city, and his Madonnas are striking types of Andalusian beauty—human forms which he lifted to the sky, and therefore less refined and ethereal than the angels which Raphael was in the habit of calling down to his canvas.

In the council chamber of the Academy of San Fernando are several Murillos, but the one that hangs over the president's chair, known as the Tinoso, which represents St. Isabella, Queen of Hungary, healing the lepers, is the most natural picture we ever saw. The figure of the queen is an embodiment of saintly grace and beauty, and appears in charming contrast to the diseased lepers, as one after another they come to have their leprous sores cleansed and healed. We have seen ideal pictures far more pleasing to the sight than this, but we doubt if any other artist living or dead, could have excelled it in power and truthfulness of delineation. Murillo has forty-six pictures in this gallery, but his best are at Seville, where he was born and lived and died.

With the exception of Velasquez, the Spanish masters devoted themselves to the deification of the church, by numerous Christs, Virgins, patriarchs, apostles, saints' martyrdoms, and to frighten the ignorant by visions of hell, purgatory, and bodily torture; therefore the visitor hunts the galleries in vain for Spanish landscapes and representations of the social characteristics of the people, which afford a rich field for artistic effects.

The old Spanish masters are all dead and buried, and none have come to take their places. We could not learn of a single artist living in Spain who enjoys a national reputation. The artists are chiefly employed in making tolerably fair copies of the old pictures.

A better idea may be formed of the high character of the Madrid gallery when it is known that there are a number of Raphael's works—one a large picture by this prince of all artists, "Christ Bearing the Cross," surrounded by stern and sorrowing figures—one of the few pictures signed by him. It has never been retouched, though somewhat faulty in coloring, a result possibly due to age and climate; nevertheless critics have pronounced it the finest picture in the world. There are sixty-two Reubens, some of them drawn from Italian and Spanish models, richly colored, and much less sensual than the fat muscular Flemish beauties that he was accustomed to paint. There are nearly three hundred and fifty fine works by Titian, Teniers, Tintoretto, Van Dyck, Paul Veronese, Giordanos, Breughel, Snyders, Poussin, Claude Lorraine, Woverman, and other artists of well known celebrity.

From Madrid we made an excursion to Aranjuez, which, in spite of all its wretchedness, boasts a royal palace and gardens of no mean pretensions, where royalty was accustomed to seek retirement in summer, amid shady groves, enlivened by the songs of nightingales, and there

> "To sit upon the ground
> And tell sad stories of the fate of kings."

From Aranjuez we went on to Toledo, probably the most ancient, curious, and interesting city in Spain. At one time Toledo was the court city, and some idea may be formed of the transformation which it has undergone when it is known that in those days its population numbered upward of 200,000, now reduced to about 17,000. Toledo is the Pompeii of Spain, and abounds in "prout-bits" which deeply interest the seeker after antiquities. The situation of the old city is remarkably picturesque, being perched upon a narrow, rocky bluff, overhanging a sharp bend in the river Tagus, with beautiful surrounding landscapes.

The Cathedral is a marvelous pile—one of the noblest in Spain, which means a good deal—and possesses treasures valued at several millions, which are hurriedly shown at certain times, for a reasonable fee. There is a curious tradition in regard to this cathedral which is worth a brief notice. One of the richest chapels is dedicated to St. Ildefonso, an eloquent controversialist, who flourished 1,200 years ago. This saint was the first advocate of the dogma of the immaculate conception of the Virgin; and the Toledans appear to believe that, in gratitude for this service, the Virgin mother twice came down from heaven and visited the cathedral, on one occasion bringing with her a finely wrought cassock, placing it upon the shoulders of the saint. This event is signalized in a large picture suspended in the church, and the very stone upon which she alighted is mortised into one of the pillars, and has been kissed for so many generations that it is now as smooth and hollow as a porcelain saucer. The garment so miraculously bestowed is preserved among the treasures of the cathedral at Oveido.

Toledo is the most singular, dried-up specimen of an old city that we have ever seen. It is almost dead, but it abounds in fine Moorish buildings, interesting churches, and elegant Jewish synagogues, and it was curious to notice that some of the churches were dismantled, deserted, and given over to ruin, being wholly useless for the want of worshipers to attend them. The streets are too narrow and crooked to permit carriages to pass through them, therefore donkeys are chiefly employed to carry burdens.

We do not know who had the best of the visit, ourselves or the natives. We were followed through the streets by a crowd of people, chiefly ragged women and children, with a liberal admixture of men beggars politely showing us the way. We wanted a pocket photograph apparatus, to catch the curious scene; but alas! the skill of the inventor had not quite met the want.

We spent a part of one night at Toledo simply because we could not conveniently get away. The hotel was altogether the most rickety, cheerless, and comfortless that we found in Europe. We were summoned to be up at four in the morning, to partake of a breakfast consisting of a cold, muddy mixture which they called coffee, and a little hard bread; the butter we could not eat, and we have not to this day the slightest notion of what materials it was composed, but concluded from the smell that foreigners must reside for some years in Spain and take out naturalization papers before they would be able to eat of it.

Breakfast done, we emerged from our chilly prison house, passing through a pompous gateway into the streets, to follow the porters who had our trunks upon their shoulders. The air cut like a razor; it was pitch dark and not a light in the street to cheer our exit, but we followed on as best we could behind the porters, twisting and turning through the dark, narrow alleys, for nearly half a mile, until we reached the Tocodover plaza, where we found a rickety old omnibus in waiting to tote us down to the station, a distance of nearly two miles. We were glad to get out of that dismal spot, which seemed to forebode evil, and to get a view of a locomotive, the only civilizing progressive feature we were able to discover.

ANOTHER SENSATION ON WALL STRERT.

On the night of Saturday, the 19th Dec., an event took place which has produced a sensation in Wall street scarcely inferior to that consequent upon the recent operations in Erie stock, with which the public ear has been filled, *ad nauseam*. This was the watering of the capital stock of the New York Central Railroad to the tune of eighty per cent. The stock before this operation was $25,000,000. It is now $45,000,000. The $20,000,000 of extra stock is called a dividend, yet it will be hard to convince the public that is the proper name for it. A singular circumstance connected with this transaction is the fact, that notwithstanding this enormous increase, the stock rose from 133 on Saturday, to 165 on Monday. Those inside the ring appear to have made a handsome thing out of the operation, while those who are left out in the cold have bled freely. Cornelius Vanderbilt is reported in the papers to have made the snug little sum of $5,000,000 out of this great corner; and his movement is considered the greatest *coup d'etat* Wall street has ever known. We have no doubt of it; and if this scheme is not nipped by judicial interference, which in this city never terminates, the people will soon be treated to an increase in the rates of passenger and freight tariffs in order to enable the stockholders to reap a further reward from that investment. Further comment is unnecessary.

The East River Bridge.

The Common Council of Brooklyn, on the evening of the 20th Dec., voted to subscribe $3,000,000 on behalf of the city toward the $5,000,000 required for the construction of the long-talked of suspension bridge across the East River, to connect New York and Brooklyn.

According to the plans heretofore published, the new bridge will start, on this side, from a point near the Register's office in the City Hall Park, and will strike the other side of the East River at the corner of Sands and Washington streets. Its largest span or reach will be 1,600 feet, which is nearly 600 feet longer than that of the bridge over the Ohio River at Cincinnati, and nearly 800 feet longer than that of the Niagara Falls bridge. Its total length will be a little over a mile, and its width 80 feet, admitting of the passage of 200,000 persons daily.

We do not doubt that the impulse thus given to this enterprise will speedily secure the remainder of the capital required, and that the completion of this great work is now assured. Our readers are familiar with its details, published with engraving on page 88 and 90, last volume of the SCIENTIFIC AMERICAN.

Combustion from Steam Radiators.

A small paper mill at Lawrence, Mass., took fire recently under singular circumstances. The *Daily American* of that town says: "In this mill was a revolving bleaching cylinder, situated over one hundred feet from the boiler supplying it with steam. The pressure of steam supplied was about sixty pounds to the square inch. It revolved within a few inches of the ceiling (as is usual) to facilitate the filling of it from the floor above, and the wood work situated over it had become, as it were, baked by the heat radiated from it. The men employed in the mill at the time of the fire state that the flame seemed, as it were, to spring out of the ceiling over the cylinder. The loss was $970 on the building and $50 on stock, which has been paid by the insurance companies. The peculiarity of its origin ought to command the attention of all who use steam pipes for heating, when they have on high pressure, and wood work around or near the steam.

Reciprocity--Mr. Greeley's Scheme.

Mr. Greeley has recently paid a visit to Montreal, where, in an address to a meeting held at the Corn Exchange in that city, he enunciated the following plan for the settlement of the reciprocity question:

The features of this plan are that the United States and Canada shall arrange matters on a basis like that at present existing among the different states of German Zollverein. A system of tariffs shall be adopted alike for both countries, on imports from abroad. Custom houses along the boundary line between the two countries shall be abandoned, leaving internal trade entirely free, but the duties collected at custom houses of the seaports shall be divided between the two countries in proportion to their population.

CHINESE IN ALASKA.—Capt. Fast late of the U. S. Army, has made a collection of antiquities from graves, etc., in Alaska, during a nine months stay in that country consisting principly of ornaments and weapons richly and skillfully carved, and which resemble those now made by the Chinese. There seems to be no doubt that these relics belong to a totally distinct race from that at present inhabiting Alaska. In this connection we learn with much interest that Professor Carl Neuman, of Munich, a diligent student of Chinese antiquities and bibliography, has discovered from the Chinese year books that a company of Buddhist priests entered this vast country *via* Alaska, a thousand years before Columbus, and explored thoroughly and intelligently the Pacific borders, penetrating into "the land of Fusung"—for so they called the Aztec territory, after the Chineese name of the Mexican aloe.

MANUFACTURE OF ARMS IN PERSIA.

SWORDS.

For the manufacture of a sword, the steel bar is first forged by a smith till it acquires the necessary shape. It then is taken by the armorer, who planes it off by a damask plane. After having been heated, it is again planed, and so on for several times; at last it is gradually brought to a very high degree of heat. In order to be assured that the blade has been exposed to the requisite temperature, it is partly polished with a paste consisting of fat and emery powder. If satisfactory, the whole of the blade is treated in this way; if not, it is again re-heated until the desired result is obtained. The blade is then immersed in fat and again exposed to the fire, which operation is repeated for several times. It then is filed and passes finally into the hands of the polisher. The manufacture of damask swords is, hence, somewhat complicated, and it requires skillful workmen. It is, also, not easy to ascertain their quality. When the back of the blade, which is generally first examined, does not show the least trace of a fissure, it is already a good sign; a better is that, when, by careful examination, it does not present any marks of welding upon its sides. Beside this, great experience is necessary for the testing of blades, which experience is only possessed by the Persians. They are very rarely deceived. De Roche Flouart relates an instance where swords were appraised by several parties at separate times, who all agreed on the same valuation. This is the more surprising as the price of a damask blade varies from $10 to $600.

THE NECESSITY OF HOME MANUFACTURE.

It is astonishing that the Persians have, as yet, shown so great a neglect in regard to their iron ore and coal mines. Though in Mazenderan a beginning has been made in the smelting of native ores, it is of too little account to be of any importance. Nearly all the iron is imported, the prices per pound being, for Prussian iron, in gold, 4·6 cents; for iron from Astrachan, 5·8 cents; for old iron, 4·0; for old nails, 6·5 for square iron, 4·0; for steel, 10·8; for Prussian cast iron, 6·1; for cast iron from Mazenderan, 1·5.

The iron mines exist in the midst of the forests of Mazenderan, where the wood is of no value whatsoever. Here would be a large field for money-making for an enterprising company, as the foreign iron would certainly soon cease to compete with that manufactured in the country itself, and although the consumption of this metal in Persia, with its eighteen millions of inhabitants, is very small compared with that of other countries, it would not be too insignificant for at least one furnace.

THE ART OF DAMASKEENING.

There is another industry in Persia which bears a close relation to the manufacture of arms; it is the damaskeening in gold and silver, which seems to form an indispensable treatment for oriental weapons. They generally use gold, except when the material is of copper, when silver is used. Sometimes designs of both metals are met with. The workmen of the present time, make up, by a great show, the skill which they do not possess, but they, nevertheless, do not lack gracefulness and elegance. The Persian style is easily recognized, in fact, so easily, that the Persian does not need to impress his mark upon his work. But, have the Persians a style of their own? We may answer this question in the affirmative, if it is sufficient to have a new system formed from an already existing one, or to have carried out actual ideas; in one word, if originality may exist in appropriation. But, if invention is indispensable for the originality of a style, the Persians have very little claims to it, for they have not invented anything which was not already the property of other nations.

The choice in designs in damaskeening is naturally very limited, a sword or sheath not affording any space for the carrying out of large geometrical figures. The swords are rarely damaskeened, they, however, bear always two signs, of which the one indicates the name of the workman, and the other a verse or a sacred passage from the Koran. Daggers, or weapons which are carried in the girt, contain more designs, as a rule, than swords.

THE THREE METHODS OF DAMASKEENING.

The first, named "zarkhonden," is employed if designs in relief are wanted. The design is first drawn by a brush; it then is engraved, small gold wires being afterwards laid into it. These wires must, of course, be large enough that they will project; they are fastened at different points with golden nails. The details are accomplished by engraving. If, for instance, a bird is to be represented, the gold which is laid in has, in general, the shape of a bird; but wings, feathers, and eyes are not indicated. This is done by engraving.

In the second method, named "zarnichanest," the design is made even to the surface of the arm. The gold is pressed in by a stone (nephrit) and is afterwards polished by a paste of emery and olive oil.

The third method is termed "zarkouste," which word is derived from the verb Koubiden, to stamp. It is most generally employed, but only is in use for metals, not for minerals or ivory, which would crack under the blows of the hammer. Instead of carving the designs, as is done in the former methods, it is only indicated. By a peculiar instrument it is then covered with holes, scarcely visible, in which the gold is pressed in the form of exceedingly fine pieces of wire. The arm is hereupon strongly heated and polished with "nephrit." This operation, being repeated, the surface is rubbed with emery and olive oil.

The best workmen live in Ispahan, but the art seems to be very much on the wane. Compared with other arts, it cannot be denied that there is still a great skill present, be it in the general arrangement of the drawing, be it in the transferring of the gold; but we must, in judging such works, also consider the time. The gold in the embossed objects which have been used much, has lost its original brightness and assumed a duller but more harmonious color. We, herewith, do not deny the dying out of this art in a more recent period, but it simply shall be indicated that some middling works of ancient times owe their superiority only to the absence of the luster, which is a merit of time and not of the skill of the artisan.

ARTISTIC OR EXPRESSIONAL DENTISTRY.

J. T. Codman, of Boston, Mass., has communicated to the *Dental Cosmos* an article on the above subject which contains some very novel and interesting views. He says:

"The term 'expressional,' applied to dentistry is new; yet I have found no name which better serves my ideas of what is intended to be conveyed by it, viz., the preservation of the expression of the features after the loss of teeth, or the restoration of the normal expression or a better one on the insertion of artificial teeth.

"That the general mode of inserting substitutes for the natural teeth does not restore or preserve the best expression of the faces of our patients, scarcely admits of an argument. That there are dentists who make an exception to this rule is happily true, and that great general progress has been made in the past ten years toward that desirable end is also true; but that better results are attainable is certain. Doubtless, if dentists understood more of the philosophy of expression, they could attain pleasant results where they have made many failures.

"That the extracted teeth are, to a considerable extent, safe guides for the form, color, size, and shape of the new set is true, yet many cases present themselves where the arch has been overcrowded, and where the insertion of a full artificial set would be impossible without distending the lips and making a bad expression. In such cases it were better to omit some of the teeth, lessening the number, and insert teeth of nearly the natural size.

"Among the prominent failures in the expression of the sets of the present day is that of, 1st, Color—by which they are often detected at once; 2d, Length—being often too long, and sometimes too short; 3d, Size of the teeth—often too large, and often, of late, too small; 4th, Deficiency of form of each individual tooth, or what is called 'want of character,' from lack of curved lines; 5th, Want of prominence and length of the eye teeth; 6th, Too great length of the back teeth, especially in upper sets; 7th, Too much evenness or similarity; 8th, The size of the arch—often too large or too broad, sometimes very much so; 9th, The horizontal line, or line of occlusion, is too straight, often looking as though both sets were made together on one piece and cut apart with a knife.

"Turning from this dismal page of failures, let us give a momentary glance at the expression of character as shown in the teeth and physiognomy of animals in connection with man; for being all revelations of one power and parts of one system, they must all bear some analogy to each other.

"How often we all have enjoyed the pictures of animals, dressed as human beings, exclaiming 'Capital?' at these burlesques on humanity. But it is not the picture that burlesques—the animals themselves do.

"That the physiognomy of the lower animals and that of man bears the same imprint may be brought to mind by the fox with his sharp-pointed teeth, his narrow dental arch, neatly covered with his trim, delicate lips. Observe how meek and quiet he looks, with his twinkling eyes half shut and his nose over his paws. Now arouse him with a rod, and how his whole expression changes; his second nature—his savage side—is uppermost, and his teeth have a most offensive look.

"Then look at one of the rodents, as the rat, with his narrow, displayed incisors, with their mean, contemptible look. He is the fellow that sneaks around at night, makes holes in your mop-boards, and gnaws your lead pipes, and occupies your drains. There is expression in his teeth, but to me it is of an ungenerous sort.

"In contrast to these, look at the incisors of the horse, and one can hardly look at the skeleton in the Natural History Society rooms without feeling that he is grinning at you. Observe the teeth of this animal, for they are worthy of a great deal of study. It almost seems that this was the pattern that dentists took for making teeth. Observe the centrals, how broad and flat they are; how unobtrusive the eye teeth, or canines, if you like the term better. Observe the horizontal line of occlusion, and the broad, regular arch. Do we see malice in this expression? Do we not see a broad, generous nature, perhaps a little coarse, but highly amiable? Who has not heard of a horse laugh—that condition of laughter when the head is thrown back, and from central to molar all the teeth are shown in the plentitude of their ivory luster?

"But my limits forbid following this train of thought further.

"You will say, What has all this to do with the expression of artificial teeth? Have a moment's patience and you may see.

"Observe all these animals, and let me ask you if any one of them looked as though it had in a set of artificial teeth, and you will say that the harmony of their color and the complexion and the perfect adaptation will answer that question.

"Our artificial teeth should have this same harmony, and I announce that no artificial teeth can be perfect without harmony of color between them and the complexion.

"In short, if the color is too light, they make the complexion appear ghastly; if too dark, they apparently darken the complexion.

"All the faults I have named have much to do with the expression. If the teeth are too long, the mouth is opened too wide and the lips are drawn down to cover them, thus thinning the lips, giving a close-mouthed look, except when the person laughs or talks, and then there is too much display of dentistry. If the teeth are too short the lips are drawn up and thickened, giving a shrewish expression, and making it appear at times as though the person had no teeth. If the arch is too large, it takes up the lips and cheek, giving also an undue prominence to the lips, making a sensual or babbling expression, varying according to the size of the arch. Want of prominence of the eye teeth allows the corners of the upper lips to fall down, making a mournful expression. If the eye teeth are too long, and prominent or sharp, we have a savage expression. But leaving many of the criticised points, I desire to speak of size and style in giving characteristic effect.

"A fine, brave, generous boy said to me a few days since, 'are not my teeth larger than usual?' 'They are!' said I. I could have told him so with my eyes shut, for he had a winning, open, frank, generous manner that was not consistent with small teeth. Since then I have worked for a lad some years older, with remarkably pointed eye teeth and bicuspids, but I have no insight into his character, although he was the son of an old friend; his secretive disposition made him reserved in expression.

"Show me, if you can, a person with irregular teeth, and not show me one who is undeveloped at some grand point of character; irregularity being, I contend, mostly want of development.

"Take from your specimens any central tooth, and you may judge to a certain degree, the character of the former owner. The delicate-formed slender teeth you will not call the teeth of a giant but of a delicate woman. Those sound, plump looking teeth are a man's. Those short, yellow, small teeth are usually set in a prominent alveolar ridge and large arch; I will testify that the owner came from a long-lived family and is a great worker.

"From these and similar indications, the dentist must build up his science of expression. As I have said, the natural teeth are a prominent and the best guide the dentist can have; but if these are lost beyond recovery, judgment and the eye of an artist are necessary to give or restore the normal expression.

"What, then, shall the dentist do when the patient comes to him without teeth, desiring artificial ones? First, look at the patient. If the skin is light, the teeth must be in harmony. If the features are large, the teeth must be large also. If thin, and narrow, and delicate, the teeth must be so also. If nervous and long limbed, indicated by long thin hands and feet, the teeth should be long in proportion to the width; and if, with plenty of money in his pocket, he quibbles by the hour for the lowest price, put in a set of narrow teeth, and he will be perfectly satisfied, as it will suit his character perfectly.

"If your generous-hearted, full-souled friend desires teeth, and you place some small, narrow teeth in his mouth, it would be like putting teeth like those of a rat in the mouth of a horse or cow; and if in the mouth of your sharp, versatile friend you place a set of teeth, whose horizontal line shall be straight, and whose eye teeth shall be deficient in prominence, it would be like putting the teeth of a horse in the mouth of a fox or dog. And if in the mouth of your mean, sniveling person you place a generous and wide set of centrals and laterals, you give him a character better than he deserves."

BLASTING WITH NITRO-GLYCERIN AT THE HOOSAC TUNNEL.

From the North Adams (Mass.) Transcript.

Monday, March 2, A. D. 1868, ushered in a snowing, gusty day; the wind, during the preceding night, had been urging puffs of snow, dry and crystalline, through every cranny of the mountain shanty, before whose soapstone stove I had been warming my rheumatic limbs; and, since travel seemed impracticable, I made a virtue of necessity, and accepted an invitation from my host to descend the west shaft of the Hoosac Tunnel, where the temperature, 60 deg. F., would at least be more agreeable than on the mountain side, where the thermometer was then 6 deg. below zero.

So donning a miner's suit, rubber boots, Cape Ann oilskin jacket and southeaster, we stalked through the deep drifts of snow, and at 7, A. M., I found myself standing on the cage that is used for lowering and hoisting in the shaft, beside two pails, each having an inner lining of plate tin, with cover, suitable enough, as it seemed to me, to carry down hot coffee for the miners. These pails, and a conductor's lantern, were in charge of a man equipped in miner's costume, similar to our own, who was exchanging remarks with the topman, whose duty it is to signal the movements of the hoisting apparatus.

A gong sounding, we began to descend rapidly, or rather, as it seemed to me, the shaft began to rise around us in a most alarming manner.

The cold air of the outer world, descending and mixing with the warm, saturated air rising from the tunnel, caused a vapor that rendered the light of the miner's lantern scarcely visible at two paces distance. It is an unpleasant position for a stranger to be in, going down, down, down, with streams of condensed vapor pattering on the head, neck, and shoulders; and to relieve the monotony and suspense of the descent, I addressed myself to that man with the "hot coffee" pails.

"By the way, I thought I caught the word 'glycerin' spoken by that man who let us down."

"Possibly."

"Have they ever used nitro-glycerin in this tunnel? I mean that terrible explosive agent, which tears everything to atoms. I should like to see some of it, and know all about it; it would give one a sensation that would relieve a fellow of this—this oppressive feeling."

My companion deliberately lifted the cover of his pail, and taking thence an open slender tube, which seemed to contain clear water, said:

"There it is."

"What! Good —, in this cage? Do you mean to say we are boxed up in this hole with—?"

"Yes," returning his tin cylinder to the pail, and replacing the tin cover, "that is nitro-glycerin—one of twenty cartridges we are about to use in blasting."

I reflected; here I was, in a box four feet by three feet, no escape from a pail containing enough nitro-glycerin to send us up that shaft, and into eternity for the matter of that, and I had been confounding the "perilous stuff" with hot coffee. There was no help for it now, and as the heavy beat of the steam pumps and warm temperature rendered conversation difficult, I certainly felt as if I had put my foot into it, or something like it.

But we are at the bottom of the shaft.

"Stand clear there, glycerin!"

"All right, sir."

"Where's our car?"

"Here, ready; can I help you?"

"Only by keeping clear with your flaring lamps; push on."

And now, impelled by a brakeman, our car is rapidly driven to a small caboose, or cupboard, some three hundred yards from the shaft, the trip reliever by an inquiry:

"How is it the water's so high?"

"A pump gave out last night; water's been gaining since; the machinist will soon fix it."

My companion now unlocked the door of this little caboose on the left side of the tunnel, examined briefly the signal apparatus, an electric magnet and gong, then the switch or brake, which turns off the current from the wires leading to the heading, and assures himself that whilst charging the drill-holes, no electric spark can pass over the wires by any tampering with the instrument above ground; this done, he resumed the pails, and we now rapidly pushed on to the heading, about one hundred yards distant, the way enlivened by a gushing stream of water; ascending the two benches of rock, we now came upon twelve miners, each with his candle, and the foreman busy examining the finished drill-holes.

"Mr. Gregory, will you send your men back?"

"Hands back from the heading! Glycerin, lads! Pick up your tools; hurry up there, and mind you don't run foul of this man!"

"Where are your holes?"

"Here they are, good and strong."

Eighteen holes are now counted, their diameter and depth gaged; these are found to vary from twenty-six to thirty-two inches in depth, and at various angles, and in various directions from the face, each of them being capable of receiving a cartridge eleven inches long, and one and one-fourth in diameter.

"You need not stay, foreman."

"I'se no fear; I'll just help a bit. Don't mind me; I seen glycerin afore."

Carefully and deliberately a cartridge is removed from the pail; an insulated wire, with priming, exploder, and cork attached thereto, closes the open mouth of the tin cartridge; and still more carefully the cartridge, with its mischievous little wire and fulminating exploder, is now passed into the drill-hole, and pressed down to the extreme end, leaving the wire pendant therefrom like a rat's tail; when this performance has taken place in eighteen holes, a count is made—eighteen.

Now the conducting main wire is brought forward and attached to one of these pendant wires, which, by the way, on close examination, consists of two wires, when attached to one of these, the other is carried to one of the double wires of the next hole, until each of the eighteen holes is linked with the one next to it, and that to the next, forming a series of links, the first connected with the conducting, the latter with the return wire.

Then two wires, when the switch or break is suitably disposed, connect the cartridges in the holes with the electrical machine, 1,500 feet distant above ground, in the timekeeper's office.

Now, bear in mind, there is a break, one tenth of an inch from each other, of the points of the wires in each hole, and this break is armed with a sensitive priming, so that the electric spark, as it leaps from one wire to the other, ignites it; this fires a fulminate, and the explosion of this fulminate explodes the nitro-glycerin, and the nitro-glycerin plays the—with the stubborn, tough, solid rock.

But my mining friend is scrutinizing every connection, and now he counts every hole; none have been missed.

"All back!"

We now turn our backs (with a very satisfactory shrug on my part) on the masses of rock, burrowed with the eighteen drill-holes, each charged with sufficient nitro-glycerin to hurl it into fragments, aye, from the very bottom of these holes, and to send a blast of liberated gases that will hurl a puff of steam and air out of the shaft, 1,500 feet distant.

That pail, I perceive, our companion carries with him. We descend the first bench; at the second he deposits his pail, and we all hurry back to the caboose, where the miner's lights, like the *ignes fatui* seem right welcome.

But where is there a recess, a safe recess, where I may avoid the consequences of my curiosity? Narrowly watching the miners, I am aroused by the inquiry, sharp and quick in tone:

"All back away from the heading?"

"All back."

"Look out for yourselves!"

And then our sober, decided friend enters the caboose; the door is locked; the miners converse; I endeavor to secure a position by which a good number of miners are between me and that heading, and sit me down on an iron pipe, which, Mr. Gregory informs me, is to supply air to the machine drills.

"Look out, now!"

Instantly, I notice the miners carry their hands to their ears; instinctively I follow suit; the hum of conversation has ceased; a dead silence succeeds; the pulsation of the steam pump throbs; the breath comes quick;—oh, this suspense—a singular exaltation of excitement thrills through one.

"Boom—oom—ooom!"

A rush of air—my hat has gone with it; pitch dark, for every light and lantern is extinguished.

"Who's got a match?—no one, I bet."

"Yes; here's one."

"A heavy blast, that; she got it that time."

And now the foreman, our companion, and myself, make for the heading; the miners are told to keep back.

We return to where the ingenious arrangement of wires, aided by the electric machine, above ground, has effected this discharge.

As we approach within fifty feet of the heading, a warm, sweetish vapor is looming up; still on, on, on: here is a mass of rock; move carefully, there may have been a cartridge thrown out unexploded, laying at your feet. If so, don't trample on it, that's all.

Scrambling over the masses of torn broken rock, the heading is at last reached—ragged, indented, a scarred witness of the tremendous power of nitro-glycerin.

After carefully noting that each and every hole has been blown out, we return towards the miners. At the second bench, our friend picks up his pail, and assures himself of the safety of the two remaining cartridges.

We soon come to the miners; the word is passed, all safe; another foreman takes in his gang for another eighteen holes, to be drilled in eight hours, the time allotted for each shaft, and pushed back to the shaft, the truck running into the cage.

Signal being given, we commence our ascent—or, better described, now the shaft rushes down, down, down past us.

Daylight once again, and the pleasant warmth of the tunnel is exchanged for the keen north wind, and 6 deg. below zero temperature. We follow the man with the pails, over the drifting snow, to a shanty, where a good breakfast, and a hot and glowing fire, await him.

"Breakfast ready, Hoecake?"

"All ready. Blast go off all right, sah?"

"Made two feet heading—hurry up that coffee."

"What do you think of blasting, Mr. —?"

"Well, I think it gives a fellow a sort, of a kind of—new sensation, decidedly."

DANGERS OF THE USE OF THE LIGHTER PRODUCTS OF PETROLEUM.

Two disastrous accidents occurring from the explosion of the lighter products of the distillation of petroleum, one in Ohio and another in Pennsylvania, may be considered as warnings to those who use or deal with these highly inflammable substances. The first was in East Cleveland, Ohio, where the escaping gas from a reservoir of gasoline destroyed a handsome dwelling and seriously injured several of the inmates. The building was lighted by an independent gas apparatus, the reservoir of the liquid gasoline being at some distance from the house, the vapor being conducted to and through the dwelling by pipes in the ordinary manner, as is the common gas. Steam was used to heat the gas generator in excessively cold weather; but the gas pipes in the building had been leaking for some time, and the flame of a candle ignited the free gas in the basement, producing an explosion that nearly destroyed the building, the fire thus engendered finishing the work. Several of the inmates were severely injured.

The other case we notice occurred at Miller's Farm, just below Titusville, Pa., where a tank of benzine exploded; two men being burned to death and the distillery, or refinery in which the tank was located, destroyed.

The terms "gasoline," "benzine," "benzole," and "naphtha" are generally used indiscriminately to denote the more volatile portions of natural earth oil, or petroleum, released during the process of distillation or refining. Chemists use these terms in a more restricted or exact sense; but these products are so little removed from a gaseous state that they continually and spontaneously give off inflammable and explosive vapors at comparatively low temperatures, which require but a spark or a flame to instantly ignite, when the result is similar to the explosion of gunpowder.

REFORMS NEEDED IN THE CONSTRUCTION OF SOME ARTICLES IN COMMON USE.

The age in which utilitarianism took precedence of everything else has passed. It is no longer enough that an article designed for common use shall simply be useful, a cultivated taste requires that it shall also be beautiful. This is right; and if our designers would content themselves with the proper combination of usefulness with beauty of form, there would be no need to criticize their work. The truth is, however, that in aiming to render their work as fair to the eye as possible they forget in many cases the claims of utility.

Household furniture and table and cooking utensils, are particularly open to criticism on this score. We set ourselves to season our food from a graceful pepperbox having so narrow a neck that the finely-pulverized condiment clogs the passage, and free delivery of the pepper is impeded, while delivery of pungent expletives against the petty cause of our annoyance becomes altogether too free. Tell us also, ye artisans who invent those marvelous instruments of torture called chairs, why we should not revenge our aching backs, and affections of the spine, by wishing your handiwork at the bottom of the ocean. Beautiful to look upon are your carvings and your upholstery, but to sit upon most wearisome. True, you sometimes give us a luxurious arm chair, with angles properly inclined, and soft luxurious cushions that lap us as comfortably as a mother her child. That shows what you can do when you take into consideration the proper use of a chair. But those cushioned inclined planes, with backs for ornament not for use, since if you lean back against them you must exert yourself to keep from sliding off the seat upon the carpet, why condemn us to these persecutors and destroyers of vertebral columns? Why put casters on delusive footstools that no sooner feel the weight of your weary limbs than they commence a struggle to run off and shirk their duty? Why make our writing desks and tables so high that in order to avoid that lancinating torment under our right shoulder blade, we must amputate their legs and thus secure comfort for ourselves by a sacrifice of the comeliness of your handiwork, for whose graceful proportions you have made us pay liberally in dollars and cents, as well as in patience, while we yet hesitated to mutilate them?

But it is not alone of household furniture or utensils that we find reason to complain. The same criticism can be made upon nearly all the articles which we most commonly use. Is it not possible to combine utility with beauty in the construction of such articles? We answer, yes. But if it were not possible, we for our part, would pronounce in favor of comfort minus beauty rather than beauty minus comfort.

The New Orleans Elevator.

Large elevators seem to be coming more and more into use throughout the country. The rapidity with which these are being erected at different points is a demonstration of the great value and convenience to the grain dealers. A new one, of very large proportions, has just been completed at New Orleans, a description of which we extract from the New Orleans *Crescent*:

The storage capacity of elevator, which is situated 240 feet from edge of wharf and across the street and sidewalk, is 750,000 bushels; built after the style and material of Chicago, Milwaukee, and St. Louis elevators. The marine elevator at edge of wharf is 102 feet high—will take grain out of the largest or smallest vessel in high or low water at the rate of 6,000 bushels per hour. The grain is carried into elevator 240 feet through the conveyor building over wharf and street, so the handling and exposure to the air are equal to ordinary drying machines.

The drying machine is built in a fire-proof house attached, and the drying is done through tiles rapidly at the rate of 2,000 bushels per hour, and all by machinery, and so constructed and done there is no risk from fire, and at the trifling expense above.

The warehouse has a storage capacity of 60,000 barrels, which covers the whole wharf, 2,000 by 275 feet, one story, covered with plastic slate roof and sides, and doors of iron. Two large iron tanks of water of 200 barrels capacity stand on top of the elevator, kept constantly full by a force pump, with iron pipes which run down through each story of the building, arranged so hose can be attached in each story, and carry water anywhere in elevator or warehouse or boat or wharf.

Editorial Summary.

The managers of the Erie Railway Company have introduced a reform worthy of imitation by other roads. It is that of advertising for proposals for supplies, instead of buying them, as is too often the case, from some director or favored official, at his own price. The Erie Company invite all the manufacturers of spikes, chairs, nails, car springs, car axles, locks, and other hardware, and dealers in lumber, to come forward and name the terms at which they will furnish the articles wanted.

Ink.—W. R. Shelmire, of Philadelphia, writes us that he has succeeded in making a good copying ink from common violet writing ink, by the addition of 6 parts of glycerin to 8 parts of the ink. Using only 5 parts of glycerin to 8 of the ink, he has found the ink to copy well fifteen minutes after it has been used. He says with fine white copying paper the ink will copy well without the use of a press.

According to the *Mechanics' Magazine*, a patent has been taken out in France for making crucibles from magnesia, which forms the best materials for crucibles to melt platinum, iron, or steel in. They are molded by pressure, and are then exposed to the heat of an oxyhydrogen flame, by which they are brought to a semi-pasty condition, when the magnesia acquires its greatest density, cohesion, and hardness.

Damages Recovered against a Brooklyn Druggist.—Damages amounting to five thousand dollars were recently recovered from a South Brooklyn druggist, for having sent in October 1867, to a patient, an over dose of morphine which caused her death. Our recent article on "Poisonous Drugs and Cosmetics," was written before this judgement was rendered.

An expedition has started from Germany to visit Egypt, for the purpose of making a collection of photographic views of ancient inscriptions and monuments. An attempt has been made to photograph subterranean chambers at Memphis, by the use of the magnesium light.

The American Institute proposes to test the merits of the various petroleum burners, those who desire to find out the relative merits of their inventions can address John W. Chambers, care of the Institute, New York.

Employers in any business would subserve their own interests by so closely observing the behavior of their help as to note their attempts to do their duty, rather than to watch for every infraction of rules.

Amount of material used is no proper estimate of the product. The watch spring is more costly than the spike. Labor costs, generally, more than material; brains, than iron.

In using the grindstone it is more important to sharpen the tool than to raze the stone. It does not require a hundred pounds pressure to the square inch to grind an ax.

MANUFACTURING, MINING, AND RAILROAD ITEMS.

The new steel manufactory established last March in Chicago, is we learn from the Chicago *Railway Review*, in successful operation, having a capacity of turning out 2 600 pounds of steel daily, the steel being of excellent quality.

According to the *Ellsworth American*, Maine, the annual production of lumber there is 35,000,000 feet of long lumber; 300,000 sugar box shooks; 200,-000 laths; 5,000,000 shingles; 200,000 clap boards, and a large quantity of smaller stuff. Value of annual production estimated at from $790,000 to $950,000.

Holyoke, Mass., has ten paper mills in operation, turning out twenty-six tuns of paper daily. The largest manufactory of writing paper in the United States is said to be located in this place. It turns out five tuns per day.

The October product of the Hecla copper mine was 259 tuns; of the Calumet 162; of the Hancock, 20 tuns, 69 pounds; of the Evergreen Bluff, 22 tuns 941 pounds; of the Knowlton, 20 tuns, 1,306 pounds.

All the operatives under fifteen years of age, in the knitting factory in New Britain, Conn., have been discharged for three months, in accordance with the statute forbidding their employment more than nine months in the year.

Building railroads in winter and by moonlight may seem strange to Eastern people, says the Kansas *Journal*, but it has been done heretofore, and will be again, if we have our usual Kansas weather.

The Union Pacific has a lodging house for a force of four hundred men near the summit of Sierra Nevada, whose sole duty is to keep the track in that vicinity clear of snow during the winter.

Only 330 miles of railroad need be built to connect Portland, Oregon, with the Pacific Railroad by steam; 315 miles of the 645 miles can be traveled by steamboat.

The purchase of the leased lines of the Chicago and Northwestern Railroad Company by the Union Pacific is mooted.

Veins of coal three feet in thickness are being worked in Southern Kansas, and reports say are passing well.

NEW PUBLICATIONS.

NEWSPAPER DIRECTORY.

Messrs. Geo. P. Rowell & Co., the enterprising advertising agents, No. 40 Park Row, New York, are about to issue a complete directory of American newspapers, to be printed on fine paper and well bound. Price $5.

EVERY SATURDAY.

One of the features of the new volume of "Every Saturday," published by Field, Osgood & Co., of Boston, will be the series of occasional papers entitled "New Uncommercial Samples," by Charles Dickens.

Recent American and Foreign Patents.

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

PAPER PULP.—C. C. Fitzgerald, Phœnix, N. Y.—This invention relates to a new article of manufacture prepared from the stock of the common plantain—plantago-major—which, especially in the West Indies, grows to a considerable size, and from which, by proper manipulation, a superior paper pulp can be produced.

ICE CUTTER.—C. W. Flint, Washington, D. C.—This invention has for its object to furnish a simple, convenient, and effective machine for cutting or shaving ice in restaurants, saloons, for soda fountains, and for similar uses.

WAGON BRAKE.—George Wesley Welsh, and George Wylie, Arlington, Wis.—This invention relates to a new and improved automatic brake for wheel vehicles, and it consists in a novel construction and application of the same, whereby a very simple, economical device for the purpose specified is obtained.

SHINGLING ROOF ANGLES.—Benjamin Flowers, Jerusalem, Ohio.—This invention relates to a new and improved method of shingling the gutters, valleys, or angles formed by the joining of roofs, whereby all leakage is prevented without any important increase in the expense.

BILL HOLDER.—James D. Field, Wataga, Ill.—This invention relates to a new and improved method for holding bills, or orders, or other paper which it may be necessary to refer to.

STEAM GENERATOR.—D. F. McKim, Austin, Nevada.—This invention consists in using, in combination with a steam boiler, a series of generating and conducting tubes, connected together and to the boiler, through which the feed water is forced by the feed pump.

METHOD OF CONSTRUCTING THE CYLINDERS OF STEAM ENGINES.—William Inglis, Manchester, England.—This invention has for its object, by certain improvements in the constructive details, to render certain kinds of steam engines more durable, and less likely to get out of order, than they have hitherto been.

TUBES OR FLUES OF STEAM BOILERS.—George E. Van Amringe, New York city.—This invention has for its object to improve the construction of the flues of steam boilers so as to economise the heat, or in other words, to obtain a greater practical effect from the same amount of fuel than when the flues are constructed in the ordinary manner.

SUMMER ATTACHMENT FOR STOVES OR RANGES.—N. O. Bond, Hyannis, Mass.—The object of this invention is to provide an attachment for stoves, whereby the necessity of building a fire in the fireplace of a stove or range s obviated in summer, when a small temporary fire only is needed; thus economizing fuel, labor, and time, and avoiding the excessive heat occasioned by the ordinary fire.

COOLER FOR WATER, MILK, ETC.—Herman Pietsch, New York city.—This invention has for its object to furnish a simple and convenient cooler for water, milk, etc., and which may at the same time be used as a refrigerator when required.

DOOR RUG ALARM.—R. B. Carsley, New York city.—This invention has for i ts object to furnish an improved alarm for attachment to doorways and window frames, which shall be so constructed and arranged that it may be impossible for any one to enter through the door or window even when said door or window may be open, without sounding an alarm, and which shall at the same time be simple in construction, easily applied, and readily disengaged when not required.

MAKING CONFECTIONARY.—John Gardner, Philadelphia, Pa.—This invention relates to a new and useful improvement in the manufacture of ornamental confectionary, whereby the same is greatly improved.

BREECH LOADING FIRE-ARMS.—Pierre Jules Jacob Noël, Paris, France.—This invention relates to improvements in breech-loading ordnance of the revolving breech class, designed to provide an arrangement whereby plurality of shots may be fired simultaneously if desired, or successively with intervals for sighting when accuracy of firing is required.

WATER SUPPLY REGULATOR.—George P. Nutting, Chicago, Ill.—The object of this invention is to maintain the proper water supply in boilers by admitting steam to the supply pump, whereby the water reaches a certain level; and also to announce to the attendant the state of the water level when for any reason the supply pump fails to maintain the proper level.

VENTILATOR OPENER FOR CARS, ETC.—W. C. Stickney, and J. McGee, Steubenville, Ohio.—This invention has for its object to furnish an improved device, by means of which the pivoted sash shutter or valve of the ventilator may be opened, closed, or secured at any desired angle, conveniently and securely.

ATMOSPHERIC GOVERNOR.—B. Mackerley, Paint, Ohio.—This invention consists of a cylinder having a piston actuated by a crank or other suitable means connected to the machine or motor for which it is to act as a governor. The cylinder being provided at each end with weighted valves, which govern the ingress and egress of air into the cylinder, and thereby the resistance of the piston to the machines by the force of the blast on the valves.

CULTIVATOR.—James Hinds and James Gee, Conologue, Ill.—This invention consists of an improved arrangement of means for raising the plows out of the ground and suspending them above it; also an improved method of hanging the plow beams to the frame; and also an improved means of adjusting the pitch of the plow.

HAND RAKE.—A. Winters, Washington, Pa.—The object of this invention is to provide a more efficient hand rake than was heretofore in use. It consists in forming the rake head curved and attached to the handle with its concave side toward the handle. The tang is also bent up so that the whole of the teeth will operate when in contact with the ground.

AUTOMATIC ICE CHUTE.—John A. Wolfer, Rondout, N. Y.—This invention relates to a new and useful improvement in the method of handling ice in the process of transferring it from the ice house to barges or vessels for transportation.

PAPER-MAKING MACHINERY.—James Wrinkle, Lee, Mass.—This invention relates to a new and useful invention in paper-making machinery, and has for its object the prevention of the blue spots and lumps being formed or made in the paper during the process of manufacture.

HORSESHOE.—Joseph Barker, Champlain, N. Y.—This invention is designed to prevent what is termed "over-reaching" in horses, which consists in striking the rearpart of the fore feet with the bent part of the hind feet while trotting.

DEVICE FOR TAKING UP TREES.—Jesse Ryder, Sing Sing, N. Y.—This invention relates to a new improved device for taking up trees with a view of transplanting them, and is more especially designed to facilitate the transplanting of large trees.

APPLYING CAST STEEL TO ARTICLES OF IRON.—William H. Singer, Pittsburgh, Pa.—This invention relates to an improvement in making "iron center," "iron face," "iron back," or "cast steel," whereby (for the uses for which steel is intended) th articles are equal to pure steel.

PLOW.—Edward Wiard, Louisville, Ky.—The object of this invention is to provide a simple and effective means for attaching the straight handle of plows to the mold board.

LAMP.—W. W. Jacobs, Hagerstown, Md.—This invention relates to a new and improved lamp of that class which are designed for burning coal oil and other similar hydro-carbons which require a large amount of oxygen to support proper combustion.

COTTON GINS.—A. A. Porter, Griffin, Pa.—This invention relates to an improved arrangement of means for causing the cotton being fed with the gin to have a to-and-fro movement in a lateral direction for bringing it more perfectly into contact with the saws, thereby more thoroughly separating the seed, and at the same time working the fiber more evenly.

REEL AND SWIFT.—Wm. G. Brown, Canton, N. Y.—The nature of my invention relates to improvements in reels for winding yarn whereby it is designed to provide a reel that may be also used as a swift, and with adjustable arms which may be adapted to wind skeins of any length, and which will also give a signal to indicate when a given number of yards have been wound.

BORING TOOLS.—C. W. LeCount, Norwalk, Conn.—This invention relates to a useful improvement in tools (as drills and augers in boring bits) for boring metals and wood, and it consists in grooving the sides of the drills for boring metals, and the lips of augers and double-lipped bits for boring wood; whereby they are made to operate more perfectly and with much ease than ordinary boring tools.

STOP FASTENER FOR WINDOWS.—Henry E. Hull and Burlin T. Merritt, Sag Harbor, N. Y.—This invention relates to an improvement in the method of fastening the stop or bead casings which hold in the sashes of windows, and it consists in the application of an eccentric lever for that purpose, in combination with a pin in the bead or stop casing.

FILTERING OR POURING BOTTLE.—V. M. Griswold, Peekskill, N. Y.—The object of this invention is to construct a bottle for photographers, chemists, apothecaries, and other uses, which is so arranged that in it the liquid is filtered, and that such filtered liquid can, at the same time, be at will poured out of the bottle. It further consists in fiting an open tube through the stopper of a larger bottle. The liquid to be filtered is poured into the larger bottle, and is, before it can ascend in the tube, filtered so as to be pure when in the tube. It can then be conveniently poured out through the upper end of the tube without interfering with the filtering process.

CHILDREN'S CHAIR.—J. H. Apel, Boston, Mass.—This invention has for its object to prevent the chairs of children from falling over while the children sit at table. Many children have been injured by the tipping back of chairs, and as their chairs have to be higher in order to bring them within reach of the table, the danger of falling, as well as the subsequent injury, will be greater than on ordinary chairs. It also consists in connecting the arm supports of the chair with the table by means of chains and screw-clamps, so that thereby the chair will be fastened to the table and cannot fall.

FEED ATTACHMENT FOR MACHINES.—Samuel Brown, Philadelphia, Pa.—The object of this invention is to provide an improved motion of the fingers of the feed attachment, whereby the said fingers are actuated to move forward in feeding the material to the machine in a horizontal manner, and at the completion of the forward movement, withdraw below the surface of the feed board or apron and return beneath the said board to again rise and repeat the feeding movement, thus leaving room (during their backward movement beneath the feed board), to place on the apron the succeeding quantity of material which is to be fed up to the operating mechanism of the machine.

MACHINE FOR WEIGHING AND MEASURING GRAIN.—Lester Reynolds, Owatonna, Minn.—This invention is a cheap, simple, and durable apparatus for automatically weighing and measuring grain and registering the quantity thereof.

WROUGHT-IRON PIER FOR BRIDGES.—E. M. Grant, Macon, Ga.—This invention has for its object the construction of a simple, strong, cheap and durable iron pier for bridges and other lofty structures.

GAS MACHINE.—Jacob D. Spang, Dayton, Ohio.—The object of this invention is to improve the process of making illuminating gas or vapor from naphtha, gasoline, and other hydro-carbons, that a better gas can be produced, in larger quantities and at less expense, than heretofore; and the same machine can be employed, at pleasure, either to the manufacture of gas, directly from the hydrocarbon, or to the carbureting of common atmospheric air, as may be desired.

Answers to Correspondents.

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

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

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

W. R. W., of Wis.—A caveat may be extended from year to year upon payment of the $10 official fee. There is considerable excitement about velocipedes in this city, and training schools are in operation. With the opening of spring the interest will increase. Some manufacturers are overcrowded with orders. Such an improvement as you speak of ought to pay; but this depends so much upon proper management that we cannot give advice.

J. S., of R. I.—You will find nothing better for removing external and temporary rust from steel and iron than cocoa nut husk. It is better than cotton waste and oil or turpentine. We always kept it in the shop for cleaning polished surfaces that had become rusted.

W. B. C., of Mass.—Oiled furniture that has been scratched or marred may be restored to its original beauty simply by rubbing boiled linseed oil, used by painters, on the surface with a wad of woolen rags. Varnished furniture, dulled, may be similarly restored by the use of a varnish, composed of shellac dissolved in alcohol applied in a similar manner. Common beeswax rubbed over furniture and heated by the friction of a woolen wad briskly used is also an excellent furniture polish.

A. N. B., of N. Y.—Writing ink should be kept carefully from the air if it is desired to preserve it limpid and in proper condition for writing. We have kept ink in a small office inkstand for severa months pure and in good condition by keeping it covered from atmospheric contact. The atmosphere oxygenizes it and renders it thick and viscid.

J. W. H., of———Informs our readers that a better material than shagreen or shark skin for striking matches upon, is a section of iron wire cloth of the grade from No. 29 to No. 30; not being affected by damp weather, nor clogging. Our correspondent says it is not in general use. This is so, but it is used by those who, thinking, know.

A. G. B., of Mass.—To remove clinkers from the fire bricks of an ordinary cooking stove, put in a half peck of oyster shells on the top of a hot coal fire. The clinkers will loosen from the bricks. You may need to repeat the process.

B. H. M., of N. H., writes that he has succeeded in making plaster casts so tough that they will bear the driving of a nail into them without cracking, by immersing them for a sufficient time in a hot solution of glue, to permit its permeating the entire mass.

J. H., of Mass.—A lacquer for "bronzed dipped work" may be made thus: Alcohol, 12 gallons; seed lac, 9 lbs.; turmeric, 1 lb. to the gallon; Spanish saffron 4 oz. The saffron may be omitted if the lacquer is to be very light. A varnish for silvered brass may be obtained by dissolving shellac in alcohol. Some prefer pure copal varnish and others gum Arabic dissolved in alcohol.

D. F., of Nova Scotia.—This correspondent sends a specimen of concretion from the inside of his boiler, which is simply a carbonate of lime, very hard and about one eighth of an inch thick. He says his boiler is of the locomotive pattern and therefore difficult to free from scale by chipping. He asks for some composition that will remove the scale and prevent its future formation. Such compositions are advertised in our columns, but we have never tested them. Winan's boiler powder, however, we have heard recommended by practical engineers. Pure water for the boiler is a certain remedy.

P. V. C., of Me., asks if wearing rubber boots continuously is injurious to the feet. We do not consider them particularly so. They retain the perspiration and keep the feet moist which may be uncomfortable and inconvenient, but not necessarily injurious. A friend states that wearing rubber boots for several months while mining in California softened his corns and reduced them to natural flesh.

J. O. S., of Mass.—Asafœtida, which you incorrectly denominate "that stinking African gum," inasmuch as it is of Asiatic origin, is largely used as a condiment by the people of India and Persia, and is an important component of some of our relishes and sauces. Its effects on the system is that of a moderate stimulant, an expectorant, and anti-spasmodic. Prejudice concerning its odor is the worst objection that can be urged against it, an objection that may also be brought against that delicious vegetable, the onion.

Official List of Patents.

Issued by the United States Patent Office.

FOR THE WEEK ENDING DECEMBER 22, 1868.

Reported Officially for the Scientific American.

SCHEDULE OF PATENT OFFICE FEES:

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

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

Patents and Patent Claims.—*The number of patents issued weekly having become so great, with a probability of a continual increase, has decided us to publish, in future, other and more interesting matter in place of the Claims. The Claims have occupied from three to four pages a week, and are believed to be of interest to only a comparative few of our readers. The publication of the names of patentees, and title of their inventions, will be continued; and, also, as heretofore, a brief description of the most important inventions. We have made such arrangements that we are not only prepared to furnish copies of Claims, but full Specifications at the annexed prices:*

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

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

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

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

85,049.—Wrench.—Henry E. Anthony, Providence, R. I.
85,050.—Chair for Children.—J. H. Apel, Boston, Mass.
85,051.—Composite Vessel.—John Baird, New York city.
85,052.—Horseshoe.—Joseph Barker, Champlain, N. Y.
85,053.—Manufacture of Steel.—T.S.Blair, Pittsburgh, Pa.
85,054.—Summer Attachment for Stoves and Ranges.—N. O. Bond, Hyannis, Mass.
85,055.—Composition for Ornamental Moldings.—Charles E. Bonnett (assignor to J. P. Wilkinson & Sons), Philadelphia, Pa.
85,056.—Method of Making Cores for Molding Articles of Lead and other Metals.—Leopold Brandeis, Brooklyn, N. Y.
85,057.—Solder.—Leopold Brandeis, Brooklyn, N. Y.
85,058.—Apparatus for Drying and Pressing Coats.—Joseph Braun, Rochester, Pa. Antedated Dec. 11, 1868.
85,059.—Apparatus for Drying and Pressing Pantaloons.—Joseph Braun, Rochester, Pa. Antedated Dec. 11, 1868.
85,060.—Apparatus for Cleansing Clothes.—Joseph Braun, Rochester, Pa. Antedated Dec. 8, 1868.
85,061.—Brick Machine.—John Bretz, Wm. Sangster, and John F. Bretz, Springfield, Ill.
85,062.—Base Burning Stove.—W.S.Bronson, Hartford, Conn.
85,063.—Submerged Pump.—Benj. F. Brown, Woburn, Mass.
85,064.—Feed Attachment for Machinery.—Sam'l Brown (assignor to himself and C. R. Carver), Philadelphia, Pa.
85,065.—Reel.—Wm. G. Brown, Canton, N. Y.
85,066.—Burglar Alarm.—Isaac N. Buck, Elgin, Ill.
85,067.—Machine for Cutting Hay, Straw, and Vegetables.—Robert I. Burbank, Boston, Mass.
85,068.—Alarm Rug.—R. B. Carsley, New York city.
85,069.—Grubbing Machine.—Chas. E. Chase and Benj. F. Devendorff, Wyoming township, Mich., assignors to themselves and Jos. S. Randall.
85,070.—Article of Food.—Wm. J. Coleman, Bury St. Edmunds, and Alfred Coleman, London, England. Patented in England Nov. 19, 1867.
85,071.—Furniture Tip.—O.B.Collins, Carthage Landing, N.Y.
85,072.—Gate.—Wm. H. Cowley, Cleveland, Ohio.
85,073.—Chuck.—Samuel G. Dare, New York city.
85,074.—Car Brake.—D. H. Dotterer, Philadelphia, Pa. Antedated Dec. 5, 1868.
85,075.—Horse Blinder.—John Dunlap, Madison township, Pa.
85,076.—Locomotive Steam Engine.—Robert F. Fairle, London, England. Patented in England Nov. 14, 1867.
85,077.—Boot and Shoe Shave.—L. H. Farnsworth, Hudson, Mass.
85,078.—Paper File.—James D. Field, Watagа, Ill.
85,079.—Paper Pulp.—C. C. Fitzgerald, Phœnix, N. Y.
85,080.—Ice Cutter.—C. W. Flint, Washington, D. C. Antedated Dec. 19, 1868.
85,081.—Grinding Machine.—Joseph Flint, Rochester, N. Y.
85,082.—Shingling Roofs.—Benj. Flowers, Jerusalem, Ohio.
85,083.—Machine for Making Confectionery.—John Gardner, Philadelphia, Pa.
85,084.—Blacking Box.—W. L. Gilroy, Philadelphia, Pa.
85,085.—Cylindrical Cutter for Leather and other Materials.—James H. Golding (assignor to himself and Patrick Martin), Liverpool, England.
85,086.—Dumping Car.—George B. Goodwin and Samuel McCord, Milwaukee, Wis.
85,087.—Toy, entitled Sybil's Cave.—J. S. Griffith, Philadelphia, Pa. Antedated Dec. 8, 1868.
85,088.—Filtering and Pouring Bottle.—V. M. Griswold, Peekskill, N. Y.
85,089.—Metal for and Mode of Manufacturing Car Wheels.—Wm. G. Hamilton, New York city.
85,090.—Swage for Saw Teeth.—Edward Hamlin, Delanco, N. J.
85,091.—Gate.—Henry P. Haskin, Roscoe, Ill., assignor to himself and Joseph L. Brenton, Beloit, Wis.
85,092.—Hay Loader.—N. L. Hatch, Cape Elizabeth, Me.
85,093.—Carriage.—N. L. Hatch (assignor to himself and Charles Dyer, Cape Elizabeth, Me.
85,094.—Water Wheel.—Wm. Heupecke, Black Creek, Pa.
85,095.—Cultivator.—James Hinds and James Gee, Conologue, Ill.
85,096.—Fastening for Wagon Bodies.—Amos A. Hotchkiss, Hannibal, Mo.
85,097.—Window Frame.—Henry E. Hull and Burlin T. Merritt, Sag Harbor, N. Y.
85,098.—Steam Cylinder.—Wm. Inglis, Manchester, England.
85,099.—Lamp.—W. W. Jacobs, Hagerstown, Md.
85,100.—Water Wheel.—Nathan Johnson, Decatur, Mich.
85,101.—Wood and Coal Dumping Apparatus.—Edwin R. Kerr (assignor to himself and James L. Platt), Kewanee, Ill.
85,102.—Leather Cutting Machine.—Simeon H. King, Tunbridge, Vt.
85,103.—Shingle Machine.—Charles A. Kinney and Charles Parker, Corry, Pa.
85,104.—Gas Machine.—P. H. Lawler and Wm. H. Gibson (assignors to themselves, G. Shelton, and Quincey Van Voorhis), Rochester, N. Y.
85,105.—Steam Engine Slide Valve.—Jacob Lawson, Allegheny City, Pa.
85,106.—Rotary Steam Engine.—Wm. B. Leachman, Leeds, England.
85,107.—Drill.—C. W. Le Count, Norwalk, Conn.
85,108.—Door for Carriages, etc.—Philander Leek, Hartford, Conn. Antedated Dec. 11, 1868.
85,109.—Device for Suspending Slaughtered Animals.—Windsor Leland and Volney E. Rusco, Chicago, Ill.
85,110.—Bar for Axle Bit Blanks.—John Lippincott, Pittsburgh, Pa.
85,111.—Bottle Lock.—Wm. A. Ludden, Brooklyn, N. Y.
85,112.—Finishing Loose Hinge Buts.—Elias Luther, Platt Lyon, and Walter Edwards, West Troy, N. Y.
85,113.—Governor for Steam and other Enginery.—Benjamin Mackerly, Paint, Ohio.
85,114.—Windmill.—H. R. Macomber, Shopiere, Wis.
85,115.—Pillow Block.—Wm. R. Manley, New York city.
85,116.—Feed Water Heater for Steam Generators.—D. F. McKim, Austin, Nevada.
85,117.—Apparatus for Stirring and Cooling Lard.—John M. Meriam, Cambridgeport, assignor to North, Meriam & Co., Boston, Mass.
85,118.—Corn Plow.—Samuel J. Miller and Luna Wright, Economy, Ind.
85,119.—Making Horseshoes.—Wm. Morehouse, Buffalo, N.Y.
85,120.—Breech-loading Fire-arm.—Pierre J. J. Noel, Paris, France.
85,121.—Water Supply Regulator.—Geo. P. Nutting, Chicago, Ill.
85,122.—Coal Stove.—Peter Paradis, Rochester, N. Y.
85,123.—Machine for Folding and Cutting Material for Shoe Uppers, etc.—G. W. Parrott, B. F. Parrott, and E. H. Timson, Lynn, Mass.
85,124.—Magazine Cook Stove.—John S. Perry and James Esterly, Albany, N. Y.
85,125.—Cooler for Water, Milk, and other Liquids.—Herman Pietsch, New York city.
85,126.—Safety Bathing Apparatus.—Wm. H. Pitt, Philadelphia, Pa.
85,127.—Gate.—N. M. Platt, North Fairfield, Ohio.
85,128.—Cotton Gin.—A. A. Griffin, Ga.
85,129.—Shawl and Blanket Strap.—T. W. Porter and H. K. Porter, Boston, Mass.
85,130.—Mode of Manufacturing Toe Calk Blanks.—Abram Reese, McClure township, Pa.
85,131.—Expansive Gearing for Feeding Rolls.—John Richards, Philadelphia.
85,132.—Locking Device eor Umbrellas.—Horace T. Robbins, Boston, Mass. Antedated Dec. 16, 1868.
85,133.—Attaching Card Clothing to Cylinders of Carding Engines.—Daniel H. Rowe, Pana, Ill.
85,134.—Gambrels and their Supports for Slaughtering Purposes.—Volney E. Rusco, Chicago, Ill.
85,135.—Device for Extracting and Transporting Trees.—Jesse Ryder, Sing Sing, N.Y.
85,136.—Portable Service Heater.—Wm. H. Scanlan, Memphis, Tenn. Antedated Dec. 9, 1868.
85,137.—Car Replacer.—Henry Schreiner, Philadelphia, Pa. Antedated Nov. 3, 1868.
85,138.—Boot Shank Machine.—Lodver Schye, Chicago, Ill.
85,139.—Harvester Rake.—Samuel S. Sherman and Jeremiah G. Sherman, McHenry, Ill.
85,140.—Method of Applying Cast Steel to Articles Made of Iron.—Wm. H. Singer, Pittsburgh, Pa.
85,141.—Grain Separator.—A. B. Smith, Rochester, Pa. Antedated Dec. 5, 1868.
85,142.—Brick Machine.—Edwin Sprague, Allegheny City, Pa. Antedated Dec. 11, 1868.
85,143.—Device to Open Railway Car Ventilators.—W. C. Stickney and J. McGee, Steubenville, Ohio.
85,144.—Carriage Spring.—Anson C. Stowe, San Jose, Cal.
85,145.—Machine for Making Cut Nails.—John E. Sweet, Syracuse, and J. Boyd Elliott, New York city, assignors to Olander B. Potter and Solomon J. Gordon, New York city.
85,146.—Pointing Spikes.—Leopold Thomas, Allegheny City, assignor to Andrew Kloman, Pittsburgh, Pa.
85,147.—Railroad Car Coupling.—A. B. Thompson, Oswego, N. Y.
85,148.—Wagon Brake.—Thomas Urie, Springfield, Iowa.
85,149.—Tube for Steam Generators.—Geo. E. Van Amringe, New York city.
85,150.—Tongue for Harvesters.—Joseph Wadleigh, Chebanse, Ill.
85,151.—Wagon Brake.—Geo. W. Welsh and Geo. Wylie, Arlington, Wis.
85,152.—Plow.—Edward Wiard (assignor to himself and Samuel W. Pope), Louisville, Ky.
85,153.—Machine for Crushing Rock.—Eskridge J. Wilson, Fair Play, Cal. Antedated Dec. 12, 1868.
85,154.—Hand Rake.—A. Winters, Washington, Pa.
85,155.—Machine for Washing Dishes.—L. R. Witherell and E. A. Witherell, Galesburg, Ill.
85,156.—Automatic Ice Chute.—J. A. Wolfer, Rondout, N.Y.
85,157.—Machine for Mixing Coloring Matter with Paper Pulp.—James Wrinkle, Lee, Mass.
85,158.—Safety Bridle.—S. V. R. York, Antwerp, N. Y.
85,159.—Harvester.—Geo. W. N. Yost, Corry, Pa., assignor to the Corry Machine Company.
85,160.—Milk Cooler.—Lauren B. Arnold, Lansing, N. Y.
85,161.—Ice House.—Adam Baierle, Chicago, Ill.
85,162.—Breech-loading Fire-arm.—Hiram Berdan (assignor to the Berdan Fire-arms Manufacturing Company), New York city.
85,163.—Combined Scissors Sharpener and Screw Driver.—Garret P. Bergen, Brooklyn, N. Y.
85,164.—Lubricating Cup.—M. T. Carson, Cleveland, Ohio.
85,165.—Door Fastener.—James M. Clark, Lancaster, Pa.
85,166.—Dentifrice Paste.—G. F. J. Colburn (assignor to John Davidson), Newark, N. J.
85,167.—Horse Hay Fork.—Moses Dennis, Barton, N. Y.
85,168.—Harvester.—John A. Dodge, Auburn, N. Y.
85,169.—Self-guarding Hook.—Henry Fisher, Aurora, Ind.
85,170.—Combined Match and Cigar Box.—Gustav Graetz, Alexandria, Va.
85,171.—Wrought Iron Bridge Pier.—Edward M. Grant, Macon, Ga.
85,172.—Bark Crusher.—Benjamin Irving, New York city, assignor to H. A. Taylor, Malone, N. Y.
85,173.—Apparatus for Obtaining Extracts from Bark for Tanning, etc.—Benjamin Irving, New York city, assignor to H. A. Taylor, Malone, N. Y.
85,174.—Method of Concentrating the Extract of Bark for Tanning etc.—Benjamin Irving, New York city, assignor to H. A. Taylor, Malone, N. Y.
85,175.—Apparatus for Concentrating Extract of Tanbark.—Benjamin Irving, New York city, assignor to H. A. Taylor, Malone, N. Y.
85,176.—Steam Heater.—John Johnson, Saco, Me., assignor to New England Steam Heating Company, Boston, Mass.
85,177.—Steam Heater.—John Johnson, Saco, Me., assignor to New England Steam Heating Company, Boston, Mass.
85,178.—Peat Machine.—Zalmon Ludington, Uniontown, Pa.
85,179.—Safety Gage for Boilers.—John Marshall, Greenwich, England. Patented in England Feb. 25, 1867.
85,180.—Cartridge Charger.—Palemon Powell, Cincinnati, Ohio.
85,181.—Grain Weighing and Registering Machine.—Lester Reynolds, Owatonna, Minn.
85,182.—Potato Digger.—Francis A. Roberts, North Vassalborough, Me.
85,183.—Device for Receiving and Delivering Mails.—F. K. Sibley, Auburndale, and Levi C. Wade, Newton Upper Falls, Mass.
85,184.—Process and Apparatus for Preserving Meat and other Perishable Articles.—Thomas Sim, Charleston, S. C.
85,185.—Gas Machine.—Jacob D. Spang, Dayton, Ohio.
85,186.—Hitching Strap Buckle.—P. J. Stoll, Marshallsville, Ohio.
85,187.—Churn.—Charles Sweeney, East Bloomfield, N. Y.
85,188.—Medicated Paper for the Water Closet.—Geo. W. Thompson, Brooklyn, N. Y.
85,189.—Corn Cultivator.—D. W. Travis, Enfield, N. Y.
85,190.—Cooler for Beer and other Liquids.—George B. Turrell, New York city.
85,191.—Mold for Forming Hats.—Joseph E. Ward, Bredbury, Great Britain, assignor to Andrew D. Campbell.
85,192.—Water Closet.—Darius Wellington, Boston, Mass.
85,193.—Brush Making Machine.—Albert M. White, Thompsonville, assignor to the American Brush Company, New Haven, Conn.
85,194.—Stove Oven.—Ralph C. Whitehouse, Boothbay, Me.
85,195.—Hedge Planter.—Wesley Young, Bloomington, Ill.
85,196.—Stove Drum.—John Adams, Findlay, Ohio.
85,197.—Brick Machine.—Henry Aikin, Pittsburgh, Pa.
85,198.—Railway Rail.—Richard Anthony, Scranton, Pa.
85,199.—Fish Trap.—E. B. Beach, West Meriden, Conn.
85,200.—Self-loading Cart.—Levi A. Beardsley, Fredericksburg, Va.
85,201.—Cheese Hoop.—Alvin F. Bent, Antwerp, N. Y. Antedated Dec. 11, 1868.
85,202.—Chalk Line Box.—Solomon Beyl, Osborn, Ohio.
85,203.—Medicine Glass.—T. G. Boggs, Philadelphia, Pa.
85,204.—Runner Attachment for Carriages.—Charles F. Brigham, Worcester, Mass.
85,205.—India-Rubber Fender for Interfering Horses.—Charles Brinckerhoff, Fishkill, N. Y.
85,206.—Machine for Pegging Shoes.—John H. Brown, Watertown, Mass., assignor to Moses K. Moody, New York city.
85,207.—Machine-made Channeled and Pierced Sole for Boots and Shoes.—John H. Brown, Watertown, Mass., assignor to Moses K. Moody, New York city.
85,208.—Rack for Bottles.—Walter Burrow, Great Malvern, Great Britain.
85,209.—Grain Binder.—S. D. Carpenter, Madison, Wis
85,210.—Grain Binder.—S. D. Carpenter, Madison, Wis.
85,211.—Pocket Cutlery.—John Carreer, Southington, Conn.
85,212.—Toy.—Charles H. Cassiday (assignor to himself Wilson Jewell, and Joseph White), Philadelphia, Pa.
85,213.—Fan Blower.—Patrick Clark, Rahway, N. J.
85,214.—Bottle Stopper.—Charles J. Converse, Boston, Mass. Antedated Dec. 11, 1868.
85,215—Upsetting Machine.—Hiram Culver, Dansville, N. Y.
85,216.—Composition for Water-proof Paint etc.—Daniel M. Cummings (assignor to himself and Washington Irving Conant), Enfield, N. H.
85,217.—Ice Cutter.—George L. Cummings, New York city. Antedated Dec. 15, 1868.
85,218.—Combination of Name Plate and Letter Chute.—Alexander M. Damon and Simeon G. Lyford, Lowell, Mass.
85,219.—Wool Oiling Machine.—Richard Dexter and Hamor Gledhill, Worcester, Mass.
85,220.—Rotating Ball Motor.—Doctor Alois Drasch, St. Egidi, Austria.
85,221.—Seeding Machine.—George Esterly, Whitewater, Wis.
85,222.—Wind Musical Instrument.—William Fischer, New York city.
85,223.—Mortar.—J. A. Fremon, Montgomery, Ala.
85,224.—Feeding Percussion Cap.—A. J. French, Bridgeport, Conn.
85,225.—Apparatus for Purifying and Ageing Liquors.—A. J. Gibson (assignor to himself and Thomas A. Harrow), Cincinnati, Ohio.
85,226.—Poultry Coop.—Jackson Golder, Fort Recovery, Ohio.
85,227.—Indicator for Permutation Locks.—Anson Hardy, Boston, Mass.
85,228.—Anchor.—Frederick Howes, Boston, Mass.
85,229.—Calculating Apparatus.—Alonzo Johnson, Springfield, Mass., assignor to Sylvester Bissell and Andrew B. West, Hartford, Conn.
85,230.—Bushing for Tool Handles.—Amasa C. Kasson, (assignor to himself and Nelson C. Gridley), Milwaukee, Wis.
85,231.—Building-Block and Artificial Stone.—John Leffler, Rochester, N. Y.
85,232.—Folding Bureau-Bedstead.—D. B. Maynard, Worcester, Mass.
85,233.—Cultivator.—L. D. McClintock, Glenwood, Iowa.
85,234.—Mast Hoop.—William McKay (assignor to himself and Charles E. Bayley), Newburyport, Mass.
85,235.—Tire Tightener.—A. O Morgan (assignor to himself and William B. Loller), Nashville, Ohio.
85,236.—Fruit Jar.—George H. Myers (assignor to S. B. Rowley), Philadelphia, Pa.
85,237.—Mode of Attaching Stove Legs.—William Lister Newill (assignor to himself and Redway & Burton), Cincinnati, Ohio.
85,238.—Swing.—William B. Odenatt, Philadelphia, Pa.
85,239.—Gas Generating and Carbureting Apparatus.—James B. Olney, New York city.
85,240.—Coal Scuttle.—James T. Page (assignor to himself and William H. Brown), Rochester, N. Y.
85,241.—Cartridge Box.—Hiram E. Paine, Troy, N. Y., assignor to Henry H. Paine, Rutland, Vt. Antedated December 16, 1868.
85,242.—Liniment, or Medical Compound.—Darius C. Randall, Niles City, Mich.
85,243.—Door Fastener.—John O. Reilley, Baltimore, Md.
85,244.—Training Grape Vines.—Reuben Rowley, Rochester, N. Y.
85,245.—Permutation Lock.—James Sargent, Rochester, N.Y.
85,246.—Bolt for Safe Doors.—J. Sargent, Rochester, N.Y.
85,247.—Photographic Camera.—J. A. Scott, Lexington, Va.
85,248.—Propelling Wheel.—C. Seymour, La Porte, Ind.
85,249.—Feed Motion.—Alfred J. Shipley (assignor to the Scoville Manufacturing Company), Waterbury, Conn.
85,250.—Hames Fastener.—Thomas Skelton, Rockford, Ill.
85,251.—Type-Setting and Distributing Machine.—John T. Slingerland (assignor to Alden Type-Setting and Distributing Machine Company), New York city.
85,252.—Breech-Loading Arm.—C. E. Sneider, Baltimore, Md.
85,253.—Envelope.—George W. Starr, Washington city, D.C.
85,254.—Harvester.—George W. Stewart, Adairsville, assignor to himself and Warren Akin, Cartersville, Ga.
85,255.—Fireplace Heater.—J. M. Thatcher, Bergen, N.J.
85,256.—Bone Coal and other Filters.—Henry Torstrick, New York city.
85,257.—Faucet.—John E. Tucker (assignor to himself and Lewis Bonney), Boston, Mass., and Joseph C. Snow, Mansfield, Mass.
85,258.—Method of Extracting Gold and Silver from their Ores.—John Turnbridge, Newark, N. J.
85,259.—Carriage Wheel.—S. W. H. Ward, New York city.
85,260.—Barrel Head and Tap.—George Weaver and H. Nelson Allen (assignors to themselves and E. R. Cheney), Boston, Mass.
85,261.—Treating Cereals for the Manufacture of Flour, Meal, etc.—Emanuel Weiss, Basle, Switzerland.
85,263.—Machine for Corrugating Metal.—Richard Montgomery, New York city.
85,262.—Stop-valve for Steam and other Enginery.—H. G. Ludlow, Troy, N. Y.

REISSUES.

70,775.—Belt Lacing.—Dated November 12, 1867; reissue 3,236.—Holland C. Babcock, Cincinnati, Ohio, assignor to himself and Marshall Jewell, Hartford Conn.
48,244.—Circular Kiln.—Dated June 13, 1865; reissue 3,237.—Friedrich Edward Hoffman, Berlin, Prussia.
77,291.—Tea and Coffee Pot.—Dated April 28, 1868; reissue 3,238.—Amasa C. Kasson and Nelson C. Gridley, Milwaukee, Wis., assignees of A. C. Kasson.
71,191.—Process for Cleaning Wool and other Fibers.—Dated November 19, 1867; reissue 3,239.—Division A.—Osborne Macdaniel, New York city.
71,191.—Process for Cleaning Woolen and other Fabrics.—Dated November 19, 1867; reissue 3,240.—Division B.—Osborne Macdaniel, New York city.
69,588.—Carriage Spring.—Dated October 8, 1867; re-issue 3,241.—Jacob G. Reiff, Lancaster, Pa.
31,404.—Knitting Machine.—Dated February 12, 1861; reissue 3,242.—Mark L. Roberts, Mount Union, Ohio.
71,241.—Railroad Car Axle Box.—Dated November 19, 1867; reissue 3,243.—T. B. Stewart, Wethersfield, Conn.

DESIGN.

3,297.—School Desk.—W. P. Uhlinger, Philadelphia, Pa

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For a period of nearly twenty-five years MUNN & Co. have occupied the position of leading Solicitors of American and European Patents, and during this extended experience of nearly a quarter of a century, they have examined not less than fifty thousand alleged new inventions, and have prosecuted upward of thirty thousand applications for patents, and, in addition to this, they have made at the Patent Office over twenty thousand Preliminary Examinations into the novelty of inventions, with a careful report on the same.

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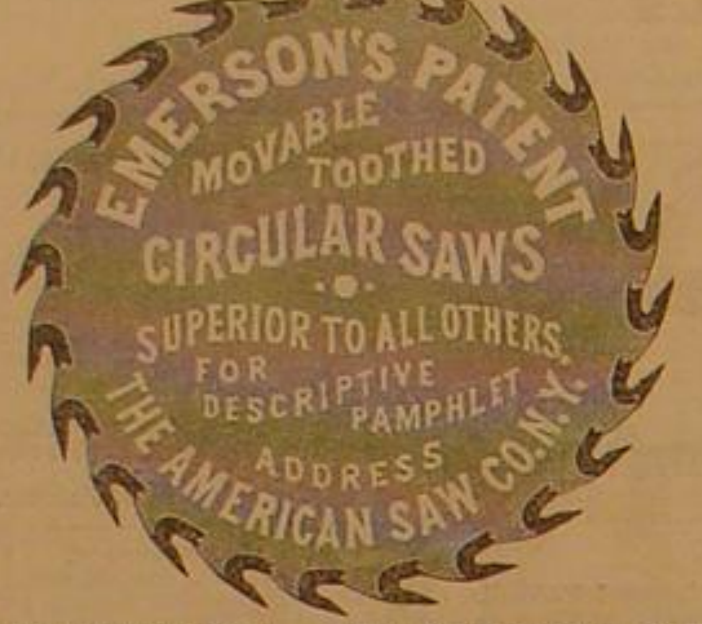

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