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Canal of Isabella II., at Madrid.

We herewith present to our readers a view of a portion of one of the most remarkable works in hydraulic engineering of modern times.

It is called the "Canal de Isabella II.," and was originally designed to supply the city of Madrid with water. It has, however, also been employed for irrigating the vegetable gardens in the environs of the Spanish capital.

This canal and the magnificent works connected with it were sanctioned by the Spanish Government in 1851, and the work was brought to completion in 1858. Its cost was 57,897,368 francs, over eleven and one half millions of dollars in gold.

The engineer who designed this immense work was Don Lucio del Vallé, engineer-in-chief to the Spanish Government. For his services he received the honor of the order of Charles the Third. He was assisted by the present engineer of the works, Don Jose de Morer.

The total length of the canal is over forty-seven miles. In this length there are seven miles of subterranean galleries, four thousand six hundred feet of aqueducts, and eight thousand six hundred feet of siphons.

There are also many remarkable trenches, retaining walls, etc., and excepting the aqueducts, the entire canal is arched over.

The water is brought from the river Lozoya, where it emerges from the Guadarama Mountains to the north of Madrid. A dam, ninety-eight feet in hight, is erected at this point, abutting on the rocks which form the banks of the river. This dam is built of cut stone, and the lake formed by it contains one hundred millions cubic feet of water.

The two principal siphons are those of Guadalix and Bedonal. The latter is the subject of the engraving which accompanies this sketch. It is about four thousand six hundred feet in length.

The transverse section of the canal has an area of about twenty square feet, and it discharges about six millions six hundred thousand cubic feet of water per day. Only about one fifth of this supply is used for the town service, the rest being employed for irrigation.

The water, on emerging from the lake, passes through a tunnel, and between this tunnel and the city of Madrid there are thirty-one tunnels, thirty-two aqueducts—among which are some about ninety feet in hight and nearly three hundred feet in length—and three great siphons, besides the enormous one shown in our engraving, employed to carry the canal across valleys, each of which is composed of four pipes about three feet in diameter.

The water for purposes of irrigation is drawn off before the canal finally discharges itself into the reservoir del Campo Guardias, which occupies the highest ground in the vicinity of Madrid.

The lands irrigated comprise four thousand four hundred and forty-six acres.

The town service comprises over sixty miles of cast-iron pipes, and over forty-five miles of subterranean canals lined with brick and cut stone. The smallest of these are sufficiently high for workmen to stand upright.

In addition to the private service in the city, thirty-five public fountains are supplied, and three thousand orifices for irrigation and extinction of fires.

Of all the aqueducts, those of La Sima and Colmenarejo are the most noteworthy. It was first intended to carry the canal at La Sima across in a siphon like those described above, and one was commenced in accordance with that design, but it was subsequently decided to erect an aqueduct. This aqueduct is two hundred and fourteen feet long and eighty three feet high. It has an arch at the bottom of fifty-five feet span, above which are seven arches of about twenty-four ft. span.

The Colmenarejo aqueduct is three hundred and eighty-four feet long and sixty feet high. This aqueduct has fifteen semicircular arches of over twenty-five feet span, built of cut limestone and granite.

Previous to the erection of these works the city of Madrid depended for its water supply partly on wells and partly on a small stream which flows into the town; the water was raised by two large pumping engines at great expense. The works we have described, now furnish water at no cost except the interest on the cost of the works and the maintenance of repairs. The head is ample to throw water over the highest buildings in the city.

Hitherto the construction of such works has been opposed by the millers upon streams, who were reluctant to surrender their rights unless exorbitantly paid. Under the new law regulating such matters, they are compelled to sell their privileges at a price fixed by appraisal.

BEDONAL SIPHON OF THE "CANAL DE ISABELLA II.," SPAIN.

THE TIDAL WAVE.

In reproducing from the London *Spectator* the following popular article on the tides, we wish it understood that we do not invite a deluge of correspondence upon the subject. Experience has warned us that there is no subject so fertile as tides. Were we to oppose no barriers to tides, they would fill our columns, overwhelm, and sink us. Therefore while we publish this article as a reflex of the doubts entertained by hosts of thinkers on both sides of the Atlantic, we do not on that account commit ourselves to lengthy discussions of the topic in future numbers.

"The approach of one of the highest Tides which the combined attraction of the sun and moon can possibly raise has made many of us look up our acquaintance with the laws of Tidal Motion. Every one has satisfied himself why the coming spring tide will be higher than usual. We know that the moon will be near the equinoctial when new, and also near her perigee; and that the combination of these circumstances at a season of the year when the tidal wave raised by the sun is unusually high, must necessarily result in causing a very remarkable tide, even though the winds should be unfavorable. For if we do not have a particularly high tide, owing to the influence of the winds being opposed to the progress of the tidal wave, there will be the equally significant phenomenon of a singular withdrawal of the water at the time of low tide. A few years ago, when a very high tide was expected on the shores of France, the winds drove back the sea, and many who had come from far inland to witness the great influx of water returned disappointed. But had they waited for six hours or so, they would have been well rewarded for their journey, since at the time of low tide the water withdrew far within the usual limits, and strange sights were revealed to the wondering fishermen who lived along that shore.

"Wrecks of forgotten ships were to be seen half buried in the ooze and slime of a bottom which had remained sea-covered for centuries. Old anchors were disclosed to view, with the broken cables attached to them, on which the lives of many gallant men had once depended, so that every parted strand seemed the record of a lost life. And crawling things and stranded fish showed how far the great sea had retreated within its ordinary bounds. We may, therefore, expect that results well worth noting will under any circumstances accompany the tidal action of October 6th, on which day the effects of the conjunction of the sun and moon on October 5th will be most strikingly manifested.

"But our object at present is less to consider the effects of the great tidal wave of October 6th, than to dwell upon some interesting effects and peculiarities of tidal motion. When we learn that astronomers for the most part recognize in the tidal wave a cause which will one day reduce the earth's rotation so effectually that instead of twenty-four hours our day will last a lunar month—while many astronomers believe that the same wave will at a yet more distant day bring the moon into collision with our globe—it will be seen that the laws of the tides have a cosmical as well as a local interest. They involve more important considerations than whether the water in the Thames will rise a foot or two higher than usual at Vauxhall Bridge on any particular day. And though many thousands of years must elapse before either of the events looked forward to by astronomers shall have happened, yet we cannot but look with deep interest into the long vista of the coming centuries. To the astronomer, at any rate, the study of what will be, or of what has been, is as interesting even as the study of what is.

"But at the very threshold of the inquiry we are met by the question, "Do any of us know the law of the tides?" The reader may be disposed to smile at such a question. Does not every book of geography, every popular treatise on astronomy teach us all about the tides? Cannot every person of average education and intelligence run through the simple explanation of the tidal wave?

"Certainly it is so. Most of us suppose we know in a general way (and that is all that we at present want), how the moon or sun draws a tidal wave after it. The explanation which nine hundred and ninety-nine (at least) out of every thousand would give runs much on this wise. Being nearer to the water immediately under her than to the earth's center the moon draws that water somewhat away from the earth; and again, being nearer to the earth's center than to the water directly beyond, the moon draws the earth away from that water. Thus, underneath the moon a heap of water is raised, and at the directly opposite point a heap of water is left (so to speak). So that were it not for the effects of friction, the water would assume a sort of egg-shaped figure, whose longest diameter would point directly towards the moon.

"And not only is this the explanation which is invariably given in popular treatises, but scientific men of the utmost eminence have adopted it, as correctly exhibiting the general facts of the case. Recently, for example, when Mr. Adams had published his proof that the moon's motion is gradually becoming accelerated in a way which the lunar theory cannot account for M. Delaunay, a leading French astronomer, endeavored to prove that in reality it is the earth's rotation which is diminishing instead of the moon's motion which is increasing. He thought the tidal wave, continually checked by the earth's friction as it travels against the direction of her rotation, would act as a sort of 'break,' since its friction must, in turn, check the earth. And in discussing this matter he took, as his fundamental axioms, the law of tidal motion commonly given in our books of geography and astronomy. This presently called up the Astronomer Royal, who gave a very clear and convincing demonstration that there would always be *low* water under the moon, if there were no friction.

"But this is not all, nor is it even the most remarkable part of the case. Eminent as the Astronomer Royal deservedly is, and especially skilful as we know him to be in questions such as the one we are considering, yet if he were *solus contra mundum*, we might readily believe that there was some flaw in his reasoning since, as every one knows, the most eminent mathematicians have sometimes misconceived the bearings of a perplexing problem.

"But, as Mr. Airy himself pointed out, Newton and Laplace were both with him.

"How is it that the views of Newton and Laplace, admittedly the very highest authorities which could be quoted, have found no place in our treatises of astronomy? Their views have never been disproved. In fact, as we have seen, one of the most eminent of our mathematicians, in re-examining the question, has come to precisely the same conclusion. Can it be that the explanation actually given is preferred, on account of its greater simplicity? That would be reasonable, if the two explanations were accordant, but they happen unfortunately to be wholly opposed to each other, and therefore one of them must be false. Those who teach us our geography and astronomy ought to look to this.

"The worst of it is, that most of the consequences which astronomers ascribe to the action of the tidal wave depend on the choice we make between the rival theories. If the ordinary view is right, the moon's motion is continually being hastened by the attraction of the bulging tidal wave, and this hastening will bring the moon into a smaller and smaller orbit until at last she will be brought into contact with the earth, unless, as Professor Alexander Herschel suggests she should crumble under the increased effects of the earth's action, and so come to form a ring of fragments around our globe. If, however, the other view is right, the moon's motion will be continually retarded, her orbit will gradually widen out, and some day, presumably, we shall lose her altogether. This retarding and hastening refer to the rate at which the moon completes her revolutions round the earth. As a matter of fact paradoxical as it sounds, it is a continual process of retarding which eventually hastens the moon's motion. Every check on the moon's motion gives the earth an increased pull on her, and this pull adds more to her velocity than she lost by the check. And *vice versa*.

"Again, if the views commonly given are just, the earth's friction should cause the tidal wave to lag behind its true place. But if Newton, Laplace, and Airy are right, then, to use the words of the last-named astronomer, 'the effect of friction will be to accelerate the time of each individual tide.'

"We apprehend that there is room for improvement in the current account of the tides. Many eminent men, as Whewell, Lubbock, and Haughton, have discussed in the most elaborate and skillful manner the laws according to which the actual tidal wave travels along the great sea-paths. But as yet no one has tried to reconcile the theory of Newton, which may be called the dynamical theory of the tides, with that commonly given in our books, which may be called the statical theory."

THE "DOGWOODS" USED IN THE MANUFACTURE OF GUNPOWDER IN ENGLAND.

CONDENSED FROM A PAPER IN "THE STUDENT" BY JOHN R. JACKSON, A.L.S.

There are few branches of science more subject to change than that which rules the conduct of warfare. Looking back but a very few years, we may easily trace such a revolution in the construction of gunnery and projectiles, that the results when considered seem somewhat startling. Such immense strides have been made, both in gunnery and naval architecture, that it is difficult to say whether, except in scientific knowledge, we are in any way benefited by modern inventions in these branches of mechanism, for no sooner is some apparently invulnerable coating invented to incase our floating ocean monsters, than a gun is almost simultaneously produced to pierce its sides. The increased power of modern projectiles is due, more to the construction of the instruments themselves than to the composition of the combustibles used, for no new explosive agent has been brought into actual use to supersede gunpowder, so that gunpowder still holds its own, and its ingredients are identical with what they were in the time of Roger Bacon, who flourished about the middle of the thirteenth century, and died in 1292, and to whom has been ascribed its discovery, though there seems great reason to suppose that it was known to the Chinese at a much earlier period. A Franciscan monk, named Berthold Schwartz, is said to have been acquainted with it at a very early date. One Ferrarius, a Spaniard, who lived in the thirteenth century, appears to have known it by the name of "flying fire," and gives a recipe for its composition. Bacon was undoubtedly well acquainted with both its composition and its combustible nature, for he says, "A little matter about the bigness of a man's thumb, makes a horrible noise and produces a dreadful coruscation; and by this a city or an army may be destroyed several ways." Gunpowder seems first to have been used towards the latter part of the reign of Henry III., but perhaps it did not come into general use in England till early in the fourteenth century, or during the reign of Edward III.

Though, as we have already said, the chief ingredients of gunpowder are the same as they were six centuries back, many improvements have of course been made in its quality and composition, as for instance in the choice of the materials used, as well as in the careful preparation and mixture of them. The charcoal is considered by the best makers the especial ingredient upon which the quality of the powder chiefly depends, so that much care is required in the selection of the proper kinds of wood to produce a good charcoal. It is to this branch of the gunpowder manufacture that we wish especially to draw attention. It may, however, be as well in passing, to say that much of the intensity of the explosiveness and consequent value of gunpowder, is due to three great causes—primarily, the purity of its ingredients; secondarily, a careful knowledge of the proportions; and thirdly, a perfect admixture of them.

With regard to the choice of the woods for gunpowder charcoal, heavy or dense woods are always rejected, and the lighter kinds chosen. The woods which recommend themselves most for use with gunpowder makers, seem to be those most free from silica, and capable of producing a friable porous charcoal which burns quickly, leaving the least possible quantity of ash. After repeated trials of various woods, such as alder, willow, hazel, spindle, poplar, lime, horse chestnut, and others, a wood known to the gunpowder makers as dogwood, was acknowledged to be the most suitable, and is now always used by the best makers for the superior kinds of powder. The history of this so-called dogwood is somewhat remarkable, inasmuch as it shows how errors are perpetuated by authors quoting one from another, and so handing down preconceived ideas which have obtained ground for want of proper and careful scientific examination at the first.

In most books relating to economic botany, or to the application of woods, *Cornus sanguinea*, or dogwood, is referred to as yielding the best charcoal for gunpowder. Certain it is that the gunpowder makers all know the wood they use in such large quantities by the name of dogwood, and it was generally believed that *Cornus sanguinea* was the plant which furnished them with their supplies. Sometime since, however, a correspondence was opened between Dr. Hooker and one of the first gunpowder makers in the kingdom, on the subject of the woods used in their trade. Specimens of these woods were sent to Kew, some were thoroughly dried and ready for calcining, others were freshly-cut specimens, and with these were sent branches with fruits attached, gathered from the same plant for the purpose of identification. These specimens proved to be not the wood of *Cornus sanguinea*, but that of *Rhamnus frangula*. Samples of the dried wood and a portion of a young tree were forthwith obtained from the Government powder works at Waltham Abbey, the former from the stack of dried timber kept ready for use, and purchased in the ordinary course of business, and the latter from the plantation round about the works. These specimens were found to be identical with those previously examined and obtained from the private works. After this, specimens were obtained of foreign grown dogwood, which upon comparison with those of English growth again proved identical; here then is proof that the *Rhamnus frangula* is the plant from whence the gunpowder makers draw their supplies, and that *Cornus sanguinea*, or true dogwood, is never used now, nor, indeed, is there any proof that it ever has been, for the powder makers maintain that what they now call dogwood is the same wood which has always been used by them.

It is but a few years since, that the bulk of this wood was supplied to the powder manufactories from English plantations, chiefly from Suffolk, Norfolk, Essex, and Kent; but after the introduction of the Enfield rifle into the military service of this country, the superior kinds of powder came much more into demand, and it was found difficult to obtain a sufficient quantity of dogwood. It was taken to the powder works in the winter of the year after the woods were cleared, the supply was very uncertain. A difficulty was likewise experienced in obtaining the desirable degree of uniformity in the length and thickness of the sticks, and the perfect clearing or scraping of the bark. Although the trees grow scattered about in most woods and plantations, it is only where the plants are grown in large quantities that the wood can be collected and sold with profit; further than this, the wood having necessarily to be perfectly free of bark, it must be collected either in the winter or early spring, when the bark is easily removed. And this spring cutting is objected to by owners of property, inasmuch as it disturbs the game just at the breeding season. All these things considered, the attention of one of the dealers in gunpowder woods was turned, some four or five years back, to the possibility of its importation from the continent, and a cargo of foreign dogwood was accordingly brought from Holland. This met with a ready sale, and since then the trade has rapidly increased, so that at the present time there are many firms established in Holland, Belgium, and Prussian Germany, who tender for the annual supply of this wood to the several gunpowder works in this country. Large tracts of marsh land and forests lying between Berlin and Frankfort, as well as in various other parts of the continent, have their undergrowth composed almost entirely of this description of dogwood, which can be obtained at a very low price.

The wood is delivered at the works in sticks, usually about six feet long, and about the thickness of a man's thumb, and tied up with strong wire into bundles about a foot in diameter. The powder makers are very particular that the wood should be neither too fine, nor too young, but of a medium growth. Crooked wood is also objected to as it will not pack well in the cylinders in which it is calcined. At the present time foreign grown dogwood is preferred before that of English growth, it is more even and regular, and better sorted, and besides this it is cheaper, for while the English product fetches, at the lowest price, about £10 per tun, the foreign wood is supplied at from £8 to £10.

The bundles of dogwood, as supplied to the gunpowder makers, vary in size and weight according to where the wood is produced, and the wood itself also differs greatly in substance and density. Quick grown wood, produced on a free soil such as that of Westphalia, weighs considerably lighter than that grown on poor soil, such, for instance, as Hanover. The standard measure of a bundle of dogwood used to be six feet long, and two feet six inches in circumference, and such a bundle weighed from eighteen to twenty-one pounds. The foreign bundles, bound together with wire, are usually much larger, forty or forty-five bundles making one tun. The sizes of the bundles are so regulated as to be conveniently handled or carried about, and the above sizes are usually agreeable to the powder makers.

From the dangerous nature of the manufacture, gunpowder works are always more or less isolated, and the land immediately surrounding the buildings thickly planted with trees and shrubs to lessen the force of the concussion in case of explosion—thus, for instance, the Messrs. Hall's works at Faversham are spread over six hundred acres of land, and much of this land is planted with alder and Rhamnus, more especially the former, for though the wood itself is not so valuable as the latter for the actual manufacture of powder, the tree is owing to its larger size, more effectual in obstructing fragments of burning timber as well as diminishing the force of the shock in case of an explosion. In some works it is the custom to stack the wood for a considerable period after being cut previous to using; thus, for instance, alder and willow would be kept for about three years, and dogwood for, perhaps, a still longer period. It has been found, however, that alder loses about twenty-five per cent of its weight in the first month after cutting, and then remains stationary; therefore the system of stacking for so long a time appears quite unnecessary.

While most botanical writers allude to the wood of the *Rhamnus frangula* as being *one* of the best for powder charcoal, they do not apply to it the name dogwood, but refer that wood to *Cornus sanguinea*, which has been generally, though it appears wrongly, accepted as furnishing the bulk of the wood used in the manufacture of the finer kinds of powder; alder, willow, and other woods, being still largely used for blasting and the coarser kinds of powder.

THE MANUFACTURE OF SULPHURIC ACID.

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

Furnaces for Burning Pyrites.—There is nothing specially new in the present construction of furnaces used for burning pyrites, but as these are scarcely used in America, but perhaps can be with advantage, it is well to refer to them here.

At first fuel was mixed with the pyrites to keep up the combustion, but this was soon abandoned, and it is found that pyrites in burning furnishes all the heat necessary to continue the combustion. The beds of pyrites are made quite thick; at Javelle, France, they are made over three feet thick, and the doors of the furnace are luted. The combustion goes on very slowly, so that forty-eight hours are required for the upper layer of the pyrites to descend to the grate bars. In this way most complete combustion is procured, and hardly two or three per cent of sulphur remain in the residue. However, to accomplish this complete combustion, the pyrites must be in lumps; but as the pyrites is obtained about 10 per cent of it is more or less pulverized, constituting one of the annoyances in this method of making sulphuric acid.

Various methods and furnaces are in use for the combustion of this fine pyrites, and they accomplish the result more or less perfectly.

The furnace of Spence, used almost universally at Manchester, is probably the best for this purpose. This furnace is a very long one, from forty to fifty feet long by six feet wide, and inclined about fifteen inches downwards. The floor of the furnace is of large flat tiles, and is heated from below by a lateral furnace three or four feet in advance of the lowest part. The fine pyrites is introduced by an opening in the top of the furnace, and is spread by means of rakes introduced through a lateral door only opened during the raking, and when it is necessary, by skillful movement, to push forward the pyrites to the lower part of the furnace. After being allowed to cool, it is drawn out of the furnace, at the front part, through an opening that supplies the requisite quantity of air by adjustment.

The roasting lasts about twenty-four hours—the furnace having twelve doors on the side, and two hours being allowed to the pyrites between each door before it is pushed forward. It is said that the fine pyrites can be made to give up all but two or three per cent of its sulphur, a result not far from what is realized with that in lumps; and when it is remembered that this fine pyrites bears a less price than that in lumps, these results are certainly of vast importance to the large factories. Kuhlmann, in his process, mixes the fine pyrites with clay, and makes small balls or cakes, that, after drying, are used in the same furnace in which he burns the lump pyrites. Five per cent of clay is sufficient to mix with the fine pyrites to form the little balls, and they can be made at a cost of about forty cents a tun in France.

The furnace that Michael Perret has introduced for burning fine pyrites in several establishments in France is highly spoken of. Instead of using the long furnace of Spence, he divides the furnace into a number of shelves, with large fire tiles, six centimeters thick and ten centimeters apart, and so placed in the masonry that the hot air and gases proceeding directly from the pyrites in lump, burning in the ordinary furnace, circulate back and forth (ascending all the time) over these shelves, on which the fine pyrites is spread to a depth of three centimeters. We may have ten or more of these shelves, until the furnace becomes inconveniently high. The operation lasts thirty-six hours, and each furnace can burn one tun of fine pyrites. This system is said to require one per cent more of niter in the subsequent operations.

Furnace of Gerstenhoffer.—We cannot omit giving a passing notice of the furnace of Gerstenhoffer, of Freiberg, which is employed by the Vieille Montagne Company, of France, and also at Swansea, in Wales. At the last-named place it is used for desulphurizing copper ores containing 30 per cent of sulphur, and from which they are now collecting the sulphurous acid and making sulphuric acid.

The furnace is composed of a quadrangular tower eighty centimeters square and six meters high, closed at the top, except a long, narrow opening extending from one side to the other. Above this opening is placed a hopper of the same length, provided with two feed rollers at the bottom, the movement of which feeds the furnace with pulverized pyrites. This pyrites, as it enters the furnace, falls on a triangular prism or cross-bar of brick fastened horizontally to the walls of the furnace, with its base uppermost. The powder gradually accumulates on this horizontal face, so as to make a pile with a triangular section, the base of which covers the face of the prism. After a short while the pyrites falls over on each side of the prism in two thin sheets, which, in descending, meet with two other prisms below so placed as to intercept it and cause it to accumulate again, and afterwards to fall over in four sheets, and so on. By successive descents over as many as twenty prisms the pyrites is brought thoroughly in contact with the heat and air of the furnace, and by the time it reaches the bottom there is not more than four or five per cent of sulphur left in it. By openings, closed by movable stoppers in the side of the furnace, the process of oxidation of the pyrites can be seen, and the influx of air can be regulated.

Utilizing the Residue from the Pyrites Furnace.—This residue, notwithstanding the little sulphur remaining in it, is used in the high furnace, mixed with ores for the production of iron. Mr. Bell, near Newcastle, and Perret in his operations, has shown that by the addition of a little common salt in the desulphurizing process, iron of a good quality can be made from this material. When this waste product from the manufacture of sulphuric acid becomes useful in a remunerative industry, another great impulse is given to the production of this acid from pyrites.

The Use of Fluxes in the Reduction of Iron Ores.

The principle upon which the use of all earthy fluxes is based, is, that, practically, no earth is fusible alone; argillaceous and silicious earths together are infusible, so with argillaceous and magnesian—so with silicious magnesian, but, when calcareous earth, lime, or limestone, is added to any mixture of the other two, all will combine and run into glass, which will become thin, with the same heat, according to the skill in proportion and treatment.

M. D'Arcet, a French chemist, made this experiment: He put into three crucibles, respectively, a ball of clay, a quartzose, or silicious sandstone ball, and a limestone or chalk ball, and exposed them to heat so great that the chalk ball fused slightly, where it had touched the sides of the crucible. They were unmelted. He then mixed them, and, in the same fire, they ran into a thin and transparent glass.

Kirwan found that argillaceous and magnesian, argillaceous and silicious, and silicious and magnesian earths would not melt in any proportion, but that silicious and calcareous earths, argillaceous and calcareous, by very strong heat, would vitrify, but not perfectly. When the earths are calcareous, argillaceous and magnesian, it requires a double proportion of the calcareous to make a glass. No glass can be made if the clay earth, or magnesian predominate. It has been found that the calcareous earth, argillaceous and silicious earths, or calcareous, magnesian, and silicious can be brought into perfect fusion, if the calcareous somewhat predominate. With a strong heat, argillaceous, silicious, and magnesian earths may form a glass without lime, and this is the only combination he tried that would thus produce glass without lime.

The metallic oxides (iron, of course, included) aided the fusion. Note, that, common clay sometimes contains one half, or more, of its weight of sand intimately mixed. If clay predominate in the iron ore the flux indicated is limestone, and if the iron be, on the contrary, mixed with limestone, the proper flux is not limestone, but clay.

Herein consists much of the practical knowledge in mixing ores so that they may flux one another, which are with difficulty fluxed alone.

Hence the necessity of a knowledge of the composition of ores to prevent the loss of fuel, of time, and of iron, by the iron becoming entangled in the scoria, or in a thick unyielding slag.—*Osborn's Metallurgy of Iron.*

Chemical Fire Engines.

Engineering states that the principle of extinguishing fires by the use of water saturated with carbonic acid, has recently been extended by a Glasgow firm to engines, which can be worked either by manual or steam power, in such a way that the component parts required for the generation of the gas are forced separately into a vessel within which they mix, and pass beneath the self-created pressure through the hose and nozzles in connection with the machine. The apparatus comprises a wheeled carriage, the body of which is in the form of a tank made with sheet iron fixed upon angle-iron frames, and which is divided into three compartments. Pumps are fitted into the compartments, and are arranged to be actuated by a beam, on a rocking shaft which is provided with the usual levers for the application of manual power. The pumps may, however, be worked by a portable steam engine, as in existing steam fire engines. The communications with the pumps are so arranged that they may draw from the tank compartments, by openings, in which case the liquids used are filled into those compartments, that is, the solution of carbonate of soda or other suitable carbonate is filled into one compartment, and the solution of tartaric acid is filled into the other compartment. Or the openings may be closed and the liquids may be drawn from other tanks or vessels by means of hose coupled to the ends of the pipes projecting out through the back of the carriage for the purpose. Air vessels, for equalizing the flow of the liquids are applied to the suction pipes. The delivery pipes from the pumps lead into a strong vessel in the front compartment, and in connection with this vessel there is a single delivery pipe, upon the projecting end of which the hose is to be coupled for leading the gas and water to the fire. A vessel receives the two liquids delivered by the pumps, and these liquids act upon each other in the vessel or generator, as it may be termed, and generate or set free the carbonic acid of the carbonate employed. This carbonic acid passes off along with the liquid and is by the hose directed upon the fire, against which it is thus in a most effectual manner made to exercise its well-known extinguishing power.

The arrangement of the various parts of the apparatus may be modified, and will depend more or less on the power intended to be developed. Thus the chemical liquids employed may form only a part of the liquid employed by the engine, water from any ordinary source being also pumped into the generator or delivery pipe either by separate pumps or by the same pumps; separate suction pipes being used in the latter case with valves or cocks to regulate the quantities of chemical liquids drawn in along with the simple water. Or, on the other hand, the two chemical liquids may be forced into the generator by separate and distinct pumping engines arranged upon the same or separate carriages.

The experiments which have been conducted with this machine show that it possesses in an extended form the merits of the smaller apparatus. The water and carbonic acid gas combined produce a far greater effect upon a fire than an equal bulk of unmixed water—an important consideration, for it happens not unfrequently that the means used for the extinction of fires are productive of as much damage as the fires themselves. A series of trials will shortly be conducted with the new chemical engines, and we shall then be able to ascertain the advantages they will actually offer over ordinary engines.

Damp Walls.

"Our attention," says the *Mechanics' Magazine*, "has of late been called to the question of rendering the walls of buildings impervious to moisture. We have received letters upon the subject from correspondents who ask us to point out a remedy for the evil. We, therefore, gladly take the opportunity of making known to our readers that there is a remedy, at once simple and efficacious. This is a process invented by Mr. Frederick Ransome, and which is being successfully carried out in practice by the Patent Stone Company, East Greenwich. It consists in the employment of colorless mineral solutions which possess the property of forming an insoluble and indestructible mineral precipitate when applied to buildings. The deposit takes place not only on the surface of the material to which it is applied, but enters the body of the substance. The application of the solution in no way alters the color of the material, a perfectly natural appearance being preserved in the building. The effect is permanent, neither atmospheric nor saline influences in the least degree affecting the indurating material. It not only renders the building water-proof, but it further most effectually indurates and preserves from decay the stone or bricks treated with it. This process has recently been applied to several buildings which are stated to have been untenantable, previously to the application, on account of exposure to a wind-driven rain. Paper now hangs well on the walls from which it formerly drooped in festoons and tatters, while dryness and a cleanly appearance have taken the place of dampness and mildew. This process of rendering buildings impervious to wet is comparatively inexpensive, therefore no one need longer to suffer from that source of discomfort and danger to health—damp walls.

Narrow Gage Railway.

The Portmadoc and Festiniog Railway, Wales, is now attracting much attention from railroad men. This is a little line in North Wales, which was originally constructed for the purpose of acting as a tramway for slate and stone from the hills of Merionethshire to the sea shore. It is now being used as a regular goods and passenger line. The chief peculiarity in its construction is that the gage is only two feet broad. Hence, though the line runs through a very difficult country, the expenses of construction and working are so small that the traffic yields the enormous revenue of thirty per cent. The reason is simple enough. It is because the proportion between the dead weight and paying weight is so much less than upon other railways. The engine and tender upon this line weigh about ten tuns, against forty tuns upon the wider gage of other lines. Instead of a first class carriage weighing seven and a half tuns, to carry thirty-two passengers, and representing nearly five cwt. of dead weight for each passenger, the carriages on the Festiniog weigh only thirty cwt. for twelve passengers, or two and a half cwt. for each person carried.

Effect of Steam Heat on Hay.—A correspondent from Rancocas, N. J., favors us with a specimen of hay wrapping which had been on a steam pipe for nine years; the pipe carrying steam at fifty-five lbs. The specimen is of a chocolate brown and very friable; but it burns no more readily than well dried fresh hay, although its appearance would seem to indicate great combustibility. We should have less fear of its ignition than of pine wood similarly carbonized.

Improved Implement for Opening Cans.

The want of a perfectly efficient, handy, and light tool for opening tin cans containing fruits, vegetables, etc., has been long felt. The practice of preserving fruits, meats, etc., in this manner has become general, and something of this kind is needed in almost every house.

The engraving tells its own tale. The instrument consists of two small levers, A and B, pivoted together at C. The pivot, C, is bent at right angles, and made sharp to act as a center punch.

Two blades, D and E, are held by clips and set screws to these levers, one blade being set at right angles to the other, These blades are adjustable to different diameters of cans.

In use the instrument is seized with both hands in the manner shown in the engraving, the center, C, is first punched vertically through the top of the can. The handles are then brought to a horizontal position, and the blade, E, is thrust through the tin, making a radial cut, shown at F. The center, C, and the blade, E, now hold the can from turning, while the lever, A, is made to perform a complete revolution, carrying with it the blade, D, and cutting out the top in a remarkably neat manner.

There is no liability of the can's turning, as in the case with many instruments made for this purpose, and thus a great annoyance is completely obviated.

Patented through the Scientific American Patent Agency, Oct. 19, 1869, by W. M. Bleakley, whom address for further information at Verplank, N. Y

BLEAKLEY'S CAN OPENER.

Steam on Common Roads.

In England, steam begins to be used on the common roads. A gentleman writes to the *Times* stating that he has received a visit in the dead of the night from a friend, who with four members of his family arrived in a steam wagonette. The reason for selecting that unearthly time for the visit was the existence of a law forbidding the use of steam carriages on the public thoroughfares except between the hours of ten at night and six in the morning, also limiting them to a speed of two miles an hour, and requiring them to be preceded by a man sixty yards in advance bearing a red flag. The writer suggests that these precautions are unnecessary, and that steam locomotives should be allowed the use of the roads at all hours, with no other precaution than a limitation of speed to twelve miles an hour. On this the *Pall Mall Gazette* remarks:

"If steam wagonettes are coming into general use, we earnestly hope that there may be some modification of the law referred to, but only for the sake of the visited. We are all delighted to receive morning visits from our friends, but there are cases in which we should be more delighted to be let alone, and we tremble to think what will be the effect of a host of visitors arriving in the early hours of the morning in steam wagonettes at the rate of two miles an hour, preceded by heralds with red flags. Why not transfer these restrictions from steam carriages to wagons, which are the cause of most of our street accidents? It would be an admirable plan to limit the speed of these vehicles and insist on their being preceded by a signal of danger"

The New York and Brooklyn Bridge.

The contract for building the caisson or foundation work of the bridge on the Brooklyn side has been awarded to the firm of Webb & Bell, of Greenpoint. The cost, with the necessary timbers, is to be about $200,000. The work is to be commenced immediately under the general superintendence of Mr William C. Kingsley, of the firm of Kingsley & Keeney. The central part of the tower on the Brooklyn side will be located at the upper slip of the Fulton Ferry. All the woodwork of the old docks and piers will be torn up, and every thing removed to low water tide. The bottom of the river will then be excavated to a depth of 22 feet below high tide, until a level area is obtained for the reception of the caisson. The dimensions of the caisson, the space to be thus cleared and leveled, is 170 feet long by 102 feet extending out into the river toward New York. The 102 feet front of the caisson, facing that city, will be on a level with the bulk head line as established by the Harbor Commissioners. The mass of large boulders with which the bottom of the river is believed to abound will be removed by blasting, and the pieces removed by powerful dredging machines. Experiments which have been made on the quicksand bed of the East River, while excavating a dry dock, prove its bearing power to be ten tuns per square foot. By Mr. Roebling's plan, it is proposed to rest upon this bed a weight of only four tuns per square foot. The weight of each tower is to be somewhat over 75,000 tuns. To distribute this vast weight so that no part of the pressure on the base shall be over four tuns per foot, it has been decided that the area of the foundation shall be 170 feet long by 102 feet broad. This area will be composed of huge timbers resting on the sand, and bearing the masonry work of the tower upon it. The timber will be 20 feet thick, and this vast mass of 20 feet by 170 by 102 will be securely bolted into one solid frame, so that the weight of the tower above can never deflect in the slightest degree at any point. The caisson, when launched, will draw 17 feet of water. It will be 170 feet long, 102 feet wide, and 15 feet deep, with a top five feet thick, and sides of a thickness tapering from 9 feet at the top to a foot below. The time required to build it will be about four months. As soon as it has been set afloat it will sink to within eighteen inches of the surface of the water and when the proper time arrives it will be towed down to the ferry and placed in position ready for being submerged. This is to be accomplished by building on the top of the caisson successive layers of timber and concrete to a hight of 20 feet. The weight of the caisson with this 20 feet of timber and cement above the "air chamber," will be 11,000 tuns.

The material excavated is hoisted from the "air chamber" through two water shafts by means of dredges, and as it is raised the caisson sinks, being uniformly undermined round the four edges and throughout its whole extent. As the caisson thus gradually sinks the mason work, inclosed in a coffer dam, is in progress on the top of the timber, thus adding the necessary weight. Access is had to this "air chamber" by means of two air shafts three feet in diameter. The depth to which it will be probably necessary to go into the bed of the river, will be about 55 feet below high water mark, so that all the timber of the foundation will be inclosed in the sand and other material through which an excavation has been made.

IMPROVEMENT IN FRAMES FOR SPECTACLES AND EYE GLASSES.

Some of our readers will be much interested in the simple but valuable improvement illustrated in the accompanying engravings. Many of them have been annoyed by glasses coming out of the frames, and have been sorely bothered in the absence of proper implements to replace them.

In the case of spectacles with spring frames, should the spring chance to break, it is difficult for people under ordinary circumstances to repair them, and much annoyance often results from the loss of time necessary in sending them to a jeweler.

The present device obviates all these annoyances, and will add greatly to the comfort and convenience of those who are obliged to assist their eyes by the use of glasses.

Fig. 1.

Figs. 1 and 2 show the improvement as applied to the old style of spectacles; Fig. 1 exhibits the rim which holds the glass closed, and Fig. 2 the same unclasped for the insertion of a glass.

Where the two ends of the rim meet, Fig. 2, one is grooved to receive a slight rib upon the other which fits into it. A clasp, A, which plays upon the same pivot as that upon which the side bows play, when closed over the end of the rim, B, holds it in place far more securely than the old screw, and may be opened or closed with the utmost facility.

Fig. 2.

A person purchasing spectacles with this method of putting in the glasses, may provide himself with an extra glass or two, and at once replace a broken one for himself, or by sending the number to the makers he may obtain a glass to correspond and insert it himself without the slightest trouble.

Fig. 3

Fig. 3 shows an improved method of attaching the springs to eye glasses. A small metallic clasp, C, is riveted to the rim. To this clasp is pivoted a small lever eccentric, D.

This lever eccentric, when opened into the position shown by the dotted lines, releases the spring, E, which is not pierced for rivets, as such springs have hitherto been. When the eccentric is closed it holds the spring securely, and the liability of the spring to break at the point where it is riveted in the form heretofore employed is obviated, the spring being as strong in one place as another. Should it break, however, at the point of junction, the eccentric may be opened by the thumb nail, the end of the spring reinserted, and the glasses can then again be used, the only inconvenience being a slight shortening of the spring, scarcely perceptible to the wearer.

Fig. 4.

Fig. 4 is an application of the same principle to another form of frames for spring glasses, the lever eccentric being in this case identical with the piece formed to rest against the side of the nose. The manner in which the spring is clasped is sufficiently well shown to render description unnecessary; the dotted outline showing the position of the lever eccentric when open; this eccentric when closed being held from opening by a small metallic button, F.

The advantages claimed for this improvement, and which we are satisfied are fully attained, are very much greater convenience to the wearer, the ready insertion and interchangeability of glasses, greater strength, without any decrease in grace and lightness, as the addition of the clasp gives scope for ornament rather than otherwise, and the easy replacing of the glasses, or the springs when broken, *without tools.*

We have been much pleased with this improvement, and the inventor informs us that it is intended to make standard size glasses, so that glasses may be sent by mail to replace such as may be broken, all the required information being the number of the glass to be replaced. This will prove a great convenience to those at a distance, and will save much trouble.

Jewelers and others who keep spectacles for sale will also find this form of bows a great convenience, as, when a peculiar style of frame pleases a purchaser, and the glasses are not right, an interchange of glasses is but the work of a few seconds, which may be done as well at the show case as the work bench.

Patented through Scientific American Patent Agency, Oct 19, 1869. For further information, address the patentees, Louis Black & Co., Detroit, Mich.

Coal and Coal Mines.

Dr. Hill, of Queen's College, Birmingham, England, in a recent lecture on the "Chemistry of the Mine," made some interesting remarks on coal and coal mines. He said:

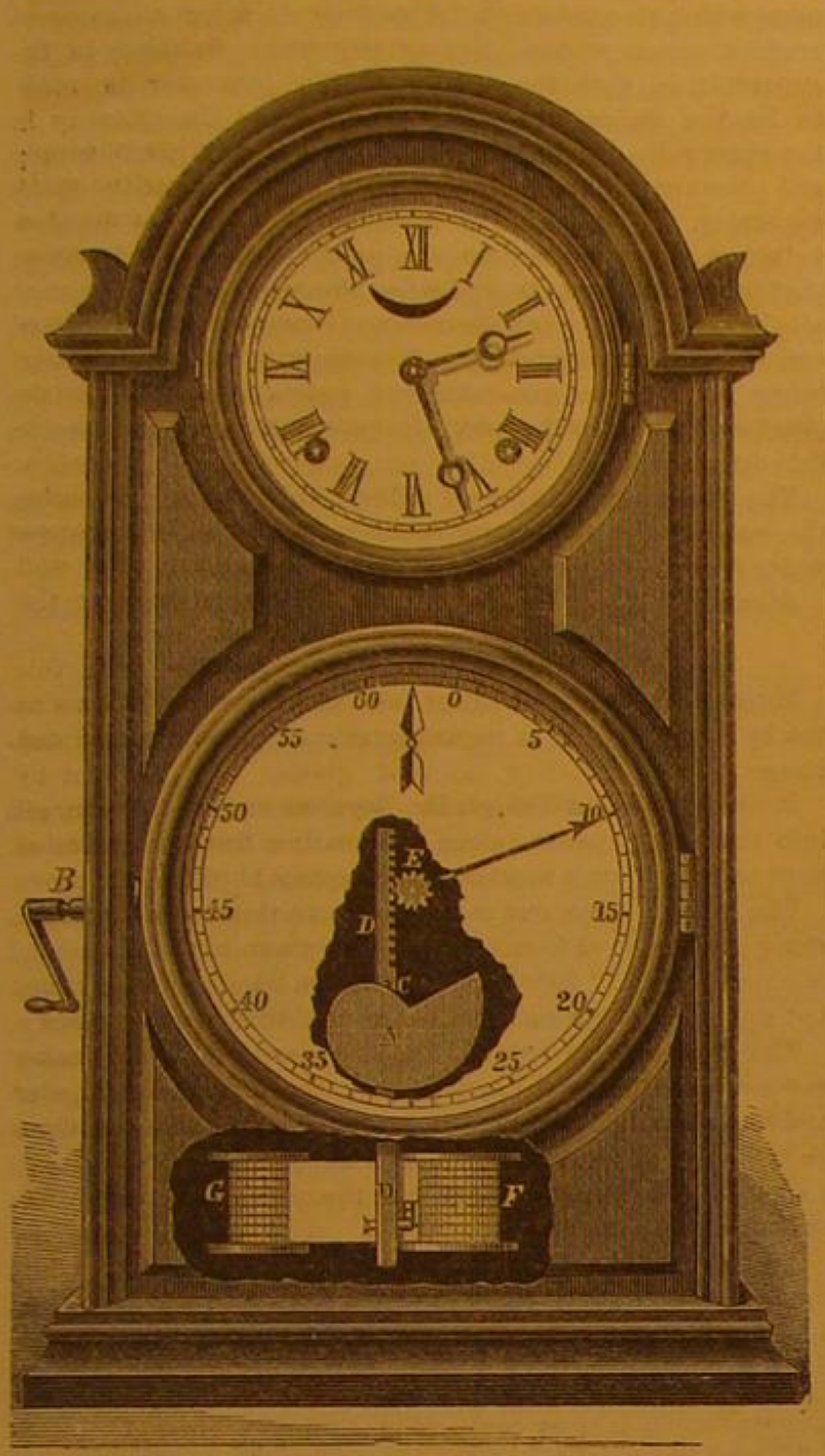
"The history of these formations was most interesting. Their age must be very great, as they have never been found with any traces of human remains. The principal animal forms were of a much lower type, consisting of snails, fish, reptiles, and insects. The impressions they have left, and the skeletons of them which remain, show that they were of a similar character to what are now known as "horsetails" pines, resembling the *Araucaria* of gardens, ferns, club mosses and a sort of palin. These were all of great size, the ferns branching to a hight of 50 feet; and the club mosses, now insignificant, were then 60 or 70 feet high. Taking into consideration the gigantic dimensions of the different plants, and the branched character of the ferns—such as only grow in hot climates—led them to conclude that England must at one time have had a tropical climate. A period when such rapidly growing and enormous plants of unlimited number existed is thus seen to have been highly favorable to the formation of those immense stores of vegetable matter—which may have been like peat beds, or carried on by river currents to their present beds—forming coal. There was no doubt but that coal was changed wood, such change being due to moisture, heat and pressure. They might look upon wood as carbon, hydrogen, and oxygen. As soon as a plant died it began to decay, and then the three elements entered into new combinations to form compounds which did not exist in the original wood. One part of the carbon entered into combination with part of the oxygen to form carbonic acid; another part combined with some of the hydrogen to form carbureted hydrogen, or "fire-damp;" while the remaining carbon, having no more oxygen or hydrogen to combine with, remains and constitutes black coal. If there were enough oxygen and hydrogen in the wood to combine with all the carbon, probably it would have been entirely removed by the same process, and there would have been no coal measures. Anthracite coal was that which had advanced furthest, and was most completely carbonized. They could easily understand after that how it was that coal had been formed, and also how carbureted hydrogen, the dangerous "fire-damp," was generated and confined in fissures in the coal, where there had been no outlet into the air. Fortunately it did not often appear among them. Coal was found at almost all elevations, from 8,000 feet above the level of the sea to 1,800 below it, as at Whitehaven, where, in addition to its depth, it is worked under the bed of the ocean for nearly a mile. It is, therefore, nearly certain that there are immense stores of coal existing at depths and in positions which render them inaccessible. Carbonic acid, known to the miners as choke-damp, is produced when carbon is burned with a sufficient amount of air or oxygen."

The Crown Prince of Prussia is said to have invented a new apparatus for the manufacture of vinegar.

THE VELOCIMETER—A NEW AID IN MECHANICS.

Modern machinists have long recognized the importance of knowing, as precisely as possible, what a machine is doing, while in motion, without waiting for ultimate results. The engineer must have his steam gage to inform him at all times the quantity of operative pressure in the boiler, and the applications of the dynamometer are made with the sole view to determine the motive power of machinery at the time of application.

Various contrivances have come into use for indicating the speed, that is to say, the number of revolutions performed within a given time, in the running of machinery. But a'l



hitherto employed may be resolved into mere "counters" of revolutions. A time-piece must be consulted both at the beginning and conclusion of the counting process, or nothing is ascertained as to the running rate. Prior to the invention which we are about to explain to our readers, nothing was ever patented in this country which proposed to indicate of itself, at all times, the running rate of machinery while in motion, so that, whenever glanced at, it would inform the observer how fast the machine was then running.

The invention referred to was patented through the Scientific American Patent Agency Nov. 26, 1867, to Mr. Edward A. Lewis, of St. Charles, Mo. It is about the size of an ordinary clock—it may be larger or smaller, according to taste—and may be connected with any running machinery either by immediate contact or in a remote part of the buildings occupied. It has two dials, placed similarly to those on calendar clocks; one an ordinary time dial, with clock movement and the other for indicating the running speed of the machinery. Its operative principle consists in a continually repeated division of time into minute periods—say of one to three seconds each—with corresponding divisions of the running movement of the machinery. The rate of speed in each of these divisions is shown on the dial by an index pointing to figures expressing, for standing machinery, the number of revolutions per minute; for locomotive engines, the number of miles per hour. Thus, the fractional period being three seconds—if a wheel makes exactly three revolutions in that time, the index will point to the figures "60" on the dial, showing sixty revolutions per minute—and will stay at those figures so long as the machinery continues to run at the same rate. The index does not move at all except when the speed is changed. Then it will move to the proper point, whether faster or slower, and there remain until another alteration is made in the speed. When the machinery stops the index recedes to "0."

The mechanism by which these results is attained may be comprehended by a reference to the accompanying engraving. A is a volute cam, or eccentric, which is caused to rotate from left to right by connection with the running machinery through the crank shaft, B. This connection is, however, so controlled by the clock movement above, that the cam moves only three seconds at a time, when it stops and returns quickly to its starting position. At C is a projecting pin in the rack bar, D, which rests on the periphery of the cam, and is thus caused to rise as the cam revolves from left to right, operating the pinion, E, which carries the index on the dial. Now it is obvious that the faster the machinery is running the higher the rack, D, will rise in the period of three seconds, and *vice versa*. When the three-second movement is accomplished, the rack and pinion are held in position by a ratchet arrangement not shown in the engraving, while the cam returns to its starting point and makes another like revolution. If the speed continues the same as in the preceding three seconds, the index will of course remain pointing at the same figures. If the speed be increasing, the index will be pushed further along. If it be decreasing, the release of the ratchet hold on the pinion, E, at the instant of the termination of the cam's three-second movement, permits the index to recede until the pin, C, again rests on the periphery of the cam, by which the diminished speed is indicated on the dial. Thus the index will always remain stationary, until there is a change in the speed of the machinery.

But the performances of this ingenious instrument do not stop with the mere indications of speed. It also records it; so that one may know at any time afterward the exact speed that was being made at any previous minute. The cylinder, F, by connection with the clock movement, is caused to revolve once per hour, winding upon itself a strip of paper from the spool, G. This paper is ruled with horizontal and perpendicular lines, similarly to that used on the steam indicator. A pencil, H, is fixed in the rack-bar, D; this marks the passing paper higher or lower as the speed is greater or less for the time being. The perpendicular lines indicate the minutes of time, while the horizontal ones represent the velocity. As placed in the engraving, the pencil mark would indicate a speed of ten miles per hour of the locomotive (supposing that to be its application) for as many minutes as there are perpendicular lines over which it passes. When the locomotive stops, the pencil will descend to the lowest horizontal line, and will there make its continuous mark, reporting the exact duration of the stoppage.

This registering apparatus is so arranged that it may be locked up within the instrument, and made inaccessible to any one but the key holder. The paper may be replaced daily or oftener. Railroad officers may thus have in their possession an exact history, as to speed and stoppages, of the movements of every train upon their road.

The dial represented in the engraving is the one designed for use on locomotives. For standing machinery the figures run up to 120, or higher if required.

An instrument of this kind is to mechanics what double-entry book-keeping is to business, a means whereby work may be done understandingly and accurately. By its use all machinery designed to be controlled by personal supervision may be made to perform its work with great uniformity, and its speed regulated with great accuracy.

As a legal evidence, in case of collisions on railways, or other accidents, its record would be of great value. Locomotive engineers are often placed in very unpleasant circumstances, by the testimony of persons incompetent to judge of the rate at which a train is moving at the time an accident occurs. This record would not only serve to protect them from such injustice, but would also keep them in check from exceeding the proper rate in crossing bridges, trestles, etc., since not only the rate at which they were running, but the precise time at which they were running it, could be accurately determined.

This instrument will prove an important addition to the means now in the hands of mechanical engineers, for the estimation of the performance of machines.

Further information may be obtained of the inventor, Edward A. Lewis, St. Charles, Mo.

AERIAL NAVIGATION.

NUMBER ONE.

There has probably been no age or generation since the earth has been inhabited by man in which the art of flying has not been a subject of study and research, if not of experiment. The apparent ease and pleasure with which the birds travel through the atmosphere cannot but induce in the hearts of human beings an earnest desire to partake of this delectable recreation; and this desire induced in one of the ancient kings the exclamation, "O that I had the wings of a dove," etc. The employment of artificial wings was the subject of experiment by hundreds of people before the nature and properties of hydrogen gas were discovered. The ponderability and inertia of atmospheric air must have been manifest at the earliest periods, being especially indicated by the locomotion of the feathered part of creation; but to what extent the science or art of aerostation had progressed prior to the founding of the Grecian Empire, history has not informed us; and even down to the sixteenth century there has been nothing recorded on the subject other than the most puerile and frivolous contrivances of wings, and the modes of operating them, by means of compound levers, springs, and cranks.

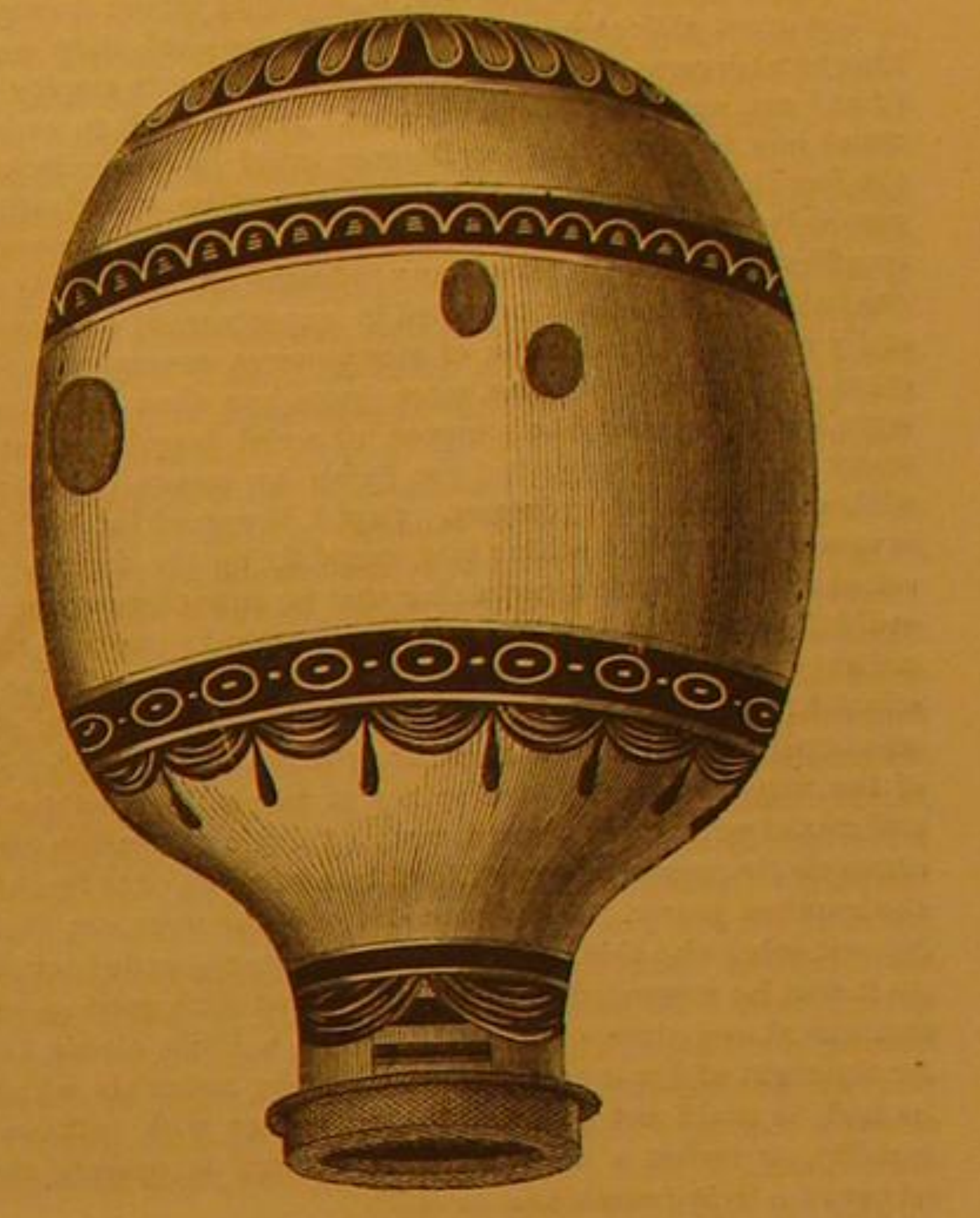
About 300 years before the Christian era, a Roman named Archytas, constructed a machine that would rise and fly "a considerable distance" through the air, by means of wings operated by springs, but as neither drawings nor description are given by historians, we are left to conjecture its peculiar mechanism. But this brief item of history serves to show that flying was a desideratum in those days as well as in more modern times.

In 1670, a man named Lana endeavored to produce an aerial float by pumping out the air from a delicately-made hollow metallic globe; but he soon discovered that if his globe was made so thin that its weight would not exceed that of the volume of air which it was capable of containing, whatever might be its dimensions or size, the external atmospheric pressure was sure to crush and collapse it before the internal air was all drawn out.

This method has recently been discussed by scientific men, but practically considered it is so absurd as not to merit a moment's serious thought.

Many experiments were made with light paper balloons (this word signifying globular, or pear-shaped bags) inflated with heated smoke or rarefied air; but no person attempted an ascension until 1783. The peculiar properties of hydrogen gas, and the mode of producing it, were discovered in 1766, and many experiments were made with it on a small scale. But it was not then expected that it would ever be produced in sufficient quantity to inflate a large balloon. Light paper balloons were exhibited, and many curious fancy figures, representing eagles and other animals floating in the air; and small illuminated balloons were sent up at night, but most of these were made to ascend by means of hot air.

In 1782, two brothers, Stephen and Joseph Montgolfier, after making many experiments on a small scale, attempted to inflate a large paper balloon with hydrogen gas, but failed on account of the escape of the gas through the pores of the unvarnished material. They then constructed a large paper balloon, seventy-four feet high and about fifty feet in diameter. This balloon had an opening at the bottom of fifteen



feet in diameter. Around this opening was arranged and fastened a gallery of wicker work, three feet wide, and around the outer edge of this was a balustrade of the same material, three feet high. This gallery was for the purpose of holding the passengers, fuel, etc. At the center of the large bottom opening was a wire grate, supported by wires, upon which the fire was made; and above the balustrade several port holes were made through the sides of the neck of the balloon for the purpose of feeding the fire with straw from the gallery outside. With this balloon, M. Pilatre de Rozier made several ascents to the hight of two or three hundred feet, while it was fastened with ropes of that length; and on the first of November, he, in company with the Marquis d'Arlandis, decided to make an aerial voyage. Accordingly, the balloon was prepared, with an ample supply of straw in the gallery, and Arlandis and Rozier stationed on opposite sides of the gallery, trimmed the straw fire, and at a given signal, the balloon was released from its moorings, and left free in air at 6 minutes to 2, on November 1, 1783; so this was the beginning of aerial sailing; it cannot properly be called navigation, as the voyagers had no control over the movements of the vessel. These adventurous balloonists sailed off gently for two or three miles till they came to a river, when the balloon turned up stream and descended nearly to the water; but another bundle of straw upon the fire lifted them up very suddenly, and, catching another current, they proceeded three miles further, and came down safely in about an hour from the time of starting, after having had sundry small holes burnt through the balloon by the sparks from the straw fire.

Rozier was killed in company with Laine his companion in an attempt to cross the channel from France to England in a hydrogen balloon in June, 1785. The balloon taking fire they were precipitated upon the rocks, thus becoming the first martyrs to the science of aerostation.

Prior to the successful experiment of 1783, a balloon of moderate size had been inflated with hydrogen gas, and permitted to ascend from Paris. It arose to a great hight, and continued in the air about an hour, in which time it traveled a distance of thirty miles. In December of the same year, two gentlemen named Charles and Roberts, made an ascent from Paris, in a balloon inflated with hydrogen gas, and traveled nearly thirty miles. This balloon was constructed under the superintendence of M. Charles, and was a truly wonderful production for that time. The balloon was nearly 100 feet in diameter, being made of varnished silk, and the upper part was covered with a net, from which a series of cords descended below the bottom of the balloon, and supported a car made of basket work, eight feet long, four feet wide, and three feet deep. The top of the balloon was also furnished with an efficient valve, for regulating its descent. This balloon appears to have been equal in all respects, to any of modern construction, no noticeable improvement having been made in balloons during the eighty-six years that have elapsed since that date.

From this time the attention of many inventors was turned to the subject of propelling balloons in any required direction; and so various and numerous were the projects and devices, that to describe them would require volumes. One man arranged a series of balloons upon a horizontal platform or flat boat, with broad horizontal wings at the sides, and an arrangement of sails at each end. Another arranged a series of balloons vertically, one above another, with various projecting arms and halliards for changing their relative positions. Many different plans were projected, in which horizontal planes were employed capable of being inclined for the purpose of producing horizontal progress by the inclination of the planes in one direction while the balloon was ascending, and in the opposite direction when the balloon was descending; the balloon being made to ascend and descend by alternately discharging the gas and the sand ballast.

The most rational and sensible plans projected, were those in which broad wings were employed in the manner of oars; the wings being thirty feet long, and the blade part about six feet wide; in rowing with them the blade was feathered, or brought to a horizontal position, while being moved forward.

The most ridiculous projects were those—and they were many and diverse—in which sails and rudders were employed, or at least, appended to the balloons. It is difficult to understand how people of any intelligence could have overlooked the fact that when when the entire apparatus was floating passively with the air current, neither sails nor rudders could be affected thereby, or exert any influence on the course of the balloon. But many persisted in experiments; and especially after the introduction of steam-power, several complicated and expensive plans, more ingenious than judicious, were introduced for the purpose of aerial traveling; and many plans were projected for flying by means of wings, without the aid of hydrogen. Capt J. Morey, of Fairlee, Vt., invented a winged machine that would fly by the force of a coiled spring. After ascertaining that no steam arrangement could be made to furnish sufficient power to support the weight of a steam boiler, he invented a very ingenious and scientific engine, in the operation of which, atmospheric air was expelled from a light metallic cylinder, by the explosion of the vapor of alcohol and spirits of turpentine combined, and mixed with about seven times its volume of common air; atmospheric pressure from without being employed to furnish the required power. Petroleum and gasoline were not then known, otherwise this invention might have succeeded better. As it was, he succeeded in propelling a boat with good speed, and was at one time offered $50,000 by a Philadelphia Co. for the right of his invention, but with the materials which he had, he could not produce the explosions with sufficient rapidity, or perfect a vacuum quick enough to operate the wings of a flying machine.

Prior to this, the effect of oblique revolving fans was discovered, and many were employed in aerial experiments. M Landelle invented a very expensive apparatus, consisting of a light boat about fifty feet long, with two tall masts or poles, upon each of which were mounted four horizontal fan wheels, similar to modern four-bladed propeller wheels, but much larger and lighter; and these were to be revolved in contrary directions by steam power, for the purpose of elevating the machine with its contents, and holding them suspended in the air, while other similar propelling wheels were adjusted at the stem, working vertically for the purpose of propelling the ship forward. This craft was furnished with rudders for steering, and a large horizontal wing, thirty by twenty feet, attached to each side of the hull, for the purpose of steadying it, and regulating its position. Below the hull, suspended by cords from each wing, was a boat-shaped car, which, with its contents, served as ballast, to keep the ship in an upright position. The steam engine was situated in the center of the main boat. The two rudders—one at each end—were judiciously formed and arranged, being very long, and each consisting of four broad leaves, two vertical and two horizontal, with a long stem in the center. Such, at least, was the project; but the voyages accomplished, or experiments made with this aerial ship, are not found in history.

On the 7th of January, 1785, a famous areonaut by name of Blanchard, accompanied by Dr. Jeffrier, an American gentleman, started in a balloon from the cliffs of Dover, England, for the purpose of sailing over sea to Calais, France. The balloon was well inflated with hydrogen, and furnished with what appeared to be an ample supply of ballast. They rose majestically, with a favorable breeze; but when they had proceeded nearly half way, they came into a vein of rarefied and chilly air, that refused to support the balloon, and they began to descend towards the middle of the channel. They threw out their ballast gradually until it was all exhausted, and then commenced throwing over all their bottles and books, next their grapples and cords, and lastly a portion of their clothing. But having nearly reached the French coast, the balloon began to ascend again, and rose to a considerable hight, so that they passed over the highlands, and, by letting out a portion of gas, they landed near the forest of Guiennes.

In consideration of this aerial feat, the King of France presented M. Blanchard with 12,000 livers, as a token of appreciation of his skill and perseverance. But the phenomenon of the sudden descent of the balloon, has never been satisfactorily explained. The balloon being wafted by, and moving in unison with the breeze, must have been surrounded by the same air, at the time of its descending tendency, that it was at the commencement of the voyage. It might have been the effect of electricity, which is known to move altogether independent of aerial currents, and which might have suddenly rarefied the air in the vicinity of the balloon, depriving it of its ordinary buoyant power; or in some inexplicable manner a vertical downward current, diffusing itself upon the surface of the ocean, might have overcome the buoyancy of the balloon.

Professor John Wise, of Lancaster, Pa., and several other popular aeronauts, have promulgated the theory that a balloonist might travel to any part of the world, by taking advantage of the various air currents at different altitudes of the atmosphere. And many announcements have been made by different aspirants for fame, of intended aerial voyages to Europe. These have been published and reiterated, and set times appointed for starting. But the uncertainties of the weather, or of finding congenial currents to waft them to the desired landing place; the difficulty of replenishing the balloon with gas by the way; the difficulty of ascertaining the direction and speed of the balloon, in a dark, cloudy night, and many other difficulties, appear to have deterred the bold aeronauts from attempting the voyage. To thus expose their lives to imminent dangers would have been worse than useless, when, even if successful, there was not the least possible prospect of anything useful being derived from the hazardous precedent. In fact, the apparent danger must have been of serious magnitude, to have discouraged Professor Wise, who has been the most daring high-flyer the world has ever produced. Upon one occasion he was bold enough to ascend to a hight of thirteen thousand feet, and there burst his balloon to demonstrate the truth of a favorite theory. He made his ascent from Easton, Pa., in the midst of a terrific thunder-storm, and rose to the hight of two miles and a quarter, and while the storm flashed and raged furiously a mile below him, he deliberately burst his balloon, thus permitting the gas to escape, and consequently he began to descend rapidly until the rush of air caused the lower part of the balloon to cave into the upper hemisphere, thus forming a mammoth parachute, whereby he was lowered down safely to terra firma, though in the midst of wind and rain. On several subsequent occasions he successfully repeated the experiment, minus the thunder and rain.

Correspondence.

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

Friction and Percussion.

MESSRS. EDITORS:—On page 246 of your issue of October 16, there is an article on "Heat, and its Relation to Friction and Percussion," apropos, and in favor of the vibratory theory.

While I am not at all disposed to take issue with the writer, "Spectrum," I must beg to differ from him in deductions from some of the cases offered. He holds that the heating of a nail held upon a grindstone is the result of the percussion arising from the jumping of the iron from one particle of the stone to the next, and estimates, indirectly, that in the majority of instances heat claimed to arise from friction is the result of percussion instead.

Let "Spectrum" hold an old-fashioned brass-headed tack or a smooth brass button between his thumb and finger, and rub it briskly up and down the grain of a planed pine board until he can guess at the amount of percussion produced, and, in my opinion, he will drop the button if he does not the theory, before he finishes the calculation.

The heat conductibility of the metal suggests an illustration relative to the heating of the nail by rapid blows of a light hammer, when slower, but heavier blows failed to raise the temperature of a nail, alluded to by "Spectrum."

Several years ago a hammered horse nail machine, now in successful operation at Falls Village, Mass., came near proving a total failure because the nails would cool before they were finished; and it was finally discovered that in slow hammering the long contact of the hammer with the heated nail conducted away the caloric, while sharp, quick blows tended to raise rather than lower the heat.

Will "Spectrum" please inform me why it is that while iron can once be heated in this way by percussion, but, if suffered to cool, the heat cannot be reproduced in the same manner, until after the iron has been heated by the absorption of foreign caloric? Then the experiment can be repeated.

New Albany, Ind. C. C. H.

How to Observe the Sun.

MESSRS. EDITORS:—On page 139, present volume, your article, "Storms in the Sun," shows conclusively that visible disturbance there is instantly followed by electric disturbance here.

A regular daily record of the visible state of the sun, compared with our meteorological records, might lead to important discoveries.

Believing that a simple means of observing and accurately recording solar phenomena would induce amateurs as well as professionals to keep such records, I respectfully propose the following method, which I have never heard of being thus used by any one before: Take an astronomical refracting telescope, with Huyghenian eye piece, into a dark room, direct it on the sun through an aperture, push in the eye piece until it is between the object glass and its principal focus; now place a fine white screen at some distance from the eye piece and focus sharply; a large, clear, well defined, erect image of the sun is thus obtained, which may be enlarged or diminished at will; arrange the aperture, increasing or decreasing the light until the finest details are visible. The sun can now be examined without darkening glasses, and by several persons at once.

For uniformity of record, I would suggest the adoption of one regular size, say a circle inscribed within one square foot, divided into square inches. The spaces being numbered from right to left, and from top to bottom, the exact position of any disturbance observed could thus be easily ascertained and recorded.

The above is a very powerful and convenient combination offering advantages rarely obtained, except by very costly instruments; for instance, to-day with a 36-in. achromatic, 6 inches in diameter, taking the image in its principal focus as one, I throw an image of the sun on the screen, magnified 900 times, a faint spot appeared to be only one, but on increasing to 80,000 times it was resolved into five separate and distinct spots.

I know of no other combination that will give a like result so cheaply. JOS. VOGLE.

Tuscaloosa, Ala.

Steam Generators.

MESSRS. EDITORS:—In your American Institute notice of my Steam Generator, on page 282, your remarks are correct so far as they go; but permit me to add that the principle upon which this invention differs from all other attempts to produce steam without having any water standing in the generator, is, that the steam in the generator is made to let the water into it, and to graduate the quantity in the exact ratio demanded, so as to keep up any given supply and pressure required—limited only by the capacity of the generator. If 50 pounds of steam be required, the overflow valve, on the water stream the pump is throwing, is set at that number of pounds, and when the pump is set in motion all the water it injects is immediately evaporated into steam, and as soon as it reaches, say, 51 pounds, it resists any more being fed into the generator, and passes back through the overflow valve into the tank, the resistance being the least in this direction.

The steam now being used reduces the pressure, releasing the water in the pipe so that it discharges just the amount of water necessary to keep up the supply demanded.

Albany, N. Y. THOMAS MITCHELL.

The Fossil Man of Onondaga.

MESSRS. EDITORS:—In your last issue I notice a letter written by Prof. Boynton in regard to this supposed antique man-image.

It now seems that though Dr. Boynton was not humbugged into the belief that the stone was really a fossil, he made almost as ridiculous a mistake in his Jesuit theory.

The image turns out to be the handiwork of a Canadian stone cutter named Geraud; who fancying himself a second Michael Angelo, "fashioned an image in likeness unto a man," but unluckily the artist died before achieving immortality.

This is an age of speculation and parties "on the make" saw a speculation in the eyes of poor Geraud's St. Paul. Geraud had scarcely been himself buried, before his statue which he fashioned in secret, was spirited away and interred also in a spot judged fitting to carry out the plot of the fraudulent schemers.

A year elapsed and poor Geraud was almost forgotten, while the one or two individuals to whom his secret had been confided had ceased to think either of him or his statue of St. Paul, when in digging a well or something of that sort, the feet of the entombed saint were discovered by the astonished (?) diggers. Inch by inch the entire image was unearthed; the speculators built there a tabernacle and reaped there large profits from a gullible public. It is said that they made more money in three days than they ever saw before in all their lives, and certainly, as a joke, as well as a speculation this scheme is the best thing achieved since Barnum's palmiest days.

Hereafter, it will be wise not to admit exhumed saints into good society until their antecedents have been well ascertained. G. B.

Syracuse, N. Y.

[There are contradictory reports about this matter. We were at first inclined to suppose the matter a humbug, but we do not feel authorized to so pronounce it in the absence of further information.—EDS.

The Prize Offered by the Swiss Government for a Time and Percussion Fuse.

MESSRS. EDITORS:—In one of the late numbers of the SCIENTIFIC AMERICAN, I observe an inquiry by a correspondent relating to a certain prize offered by the Swiss Government for percussion fuses. They want what they term a "universal fuse." I send you an article bearing on the subject taken from the *Neue Freie Presse*, of Vienna, dated the 5th Oct., which conveys all the information that is required.

Hanover, Germany. C. G. MUELLER.

"The military department of the Swiss Government has given notice, that it will pay a premium of 10,000 francs for a fuse which will possess the following qualities—a full-sized model being required. The fuse must be a time and percussion fuse. The adjustment as to time should be manageable entirely by hand; the time of burning should be at least ten seconds, and admit subdivisions of one half and one fourth seconds, the latter being also the time for the shortest adjustment. The fuse should be so constructed that it can be made ready for firing only by uncovering and time adjustment; the jarring motion of the carriage should not be able to produce accidental ignition; the fuse should be adaptable to the hollow projectiles which are used in the Swiss army. The construction should be sufficiently solid so that no premature discharge in the barrel can take place. The composition of the fulminate should be well enough protected against atmospheric influences, that after a number of years no material variation in the time of burning can be perceived The method of construction should not be laborious and expensive, and the corrrectness of the process be easily regulated."

Fresh-Water Wells near Salt Water.

MESSRS. EDITORS:—In answer to your correspondent, J. Q. Adams, page 263, current volume, I offer the following explanation: The sand is saturated with rain water which, notwithstanding the tides, will be intermixed with sea water very slowly, because the minute spaces between the sand grains prevent immediate mingling, and successive rain falls will repel the slowly advancing sea water before it reaches the well. Therefore at a certain distance from the shore the sand is always saturated with fresh water which can be obtained and used in the manner described by your correspondent.

HUGO BILGRAM.

Philadelphia, Pa.

Fire from Steam Pipes.

MESSRS. EDITORS:—About twelve years ago, when in charge of a pattern shop in New York city, I had a steam glue heater for the use of the shop, and, having noticed a pine block lying upon it for several days, I picked it up to throw it away, but noticed it was partly charred through. It excited my curiosity, and I decided to replace it and watch it; but after watching it, and having the night watchman look after it nights for about a month I gave it up. By that time it was completely charred through, not like a piece of charcoal from a pit or kiln, for it had a dark-brown color, but would ignite and burn as easily as a piece of charcoal made from the same kind of wood. I have since always been careful in putting in steam pipes to keep the pipes from coming in contact with the wood work.

With clean wood, I think there is little danger; but with wood containing considerable pitch, or saturated with oil, I think danger from spontaneous combustion is imminent. Though requiring care in putting up, I consider steam pipes the safest and most economical means of heating a factory, store, or dwelling, and have advocated their use in different ways during ten years of engineering practice.

Marquette, Mich. A SUBSCRIBER.

INFLAMMABLE GAS-ENGINES.

[By. F. A. P. Barnard, L.L.D., Commissioner to the late French Exposition.]

The enormous force developed in the explosion of gunpowder could hardly fail early to occupy the minds of the ingenious, with the effort to make it available for the uses of industry. Accordingly, we find that this problem formed a subject of study with such men as d'Hautfeuille, Huyghens, and Papin. But the intense energy of the force and the suddenness of its action seem to have discouraged the attempt to apply it directly as a motive power. The earlier experimenters occupied themselves with the endeavor to turn it to account by indirect means. The expedient which appeared to them most promising was to use it for the purpose of creating a vacuum. In fact, if a comparatively small charge of gunpowder be exploded in a closed vessel furnished with valves freely opening outward, the enormous expansion of the gaseous products of the explosion, an expansion due to the excessive heat developed, will drive out the atmospheric air through the valves, while the gases, contracting almost as suddenly as they expanded, will leave the vessel nearly void. It was first proposed to apply this principle to the elevation of water. A very simple apparatus suffices for this purpose. Let there be placed, for instance, such a vessel as has just been supposed, some fifteen or twenty feet above the level of a reservoir; a tube, open at both ends, communicating between this vessel and the reservoir will be all that is needed. So soon as the air has been expelled from the vessel by whatever means, the water of the reservoir will rise under the pressure of the atmosphere and occupy its place. This water may then be discharged at the superior level, and the apparatus will be ready for the repetition of the operation. In order to prevent the return of the water to the reservoir, when the orifices of discharge of the upper vessel are opened, the tube may have valves in it opening upward but closing under a downward pressure, or, what is simpler, it may be recurved at the upper extremity and enter the explosion chamber by the top. Such was the application of this power suggested by d'Hautfeuille. Huyghens perceived that it was capable of being turned to more varied uses. He proposed to employ a cylinder with a movable but air-tight piston to serve as an explosion chamber, with a view to obtain a reciprocating motion. In fact, by blowing out the air contained in such a cylinder through valves properly disposed, the atmospheric pressure could be made to force the piston downward, and thus indirectly to move the arm of a lever to raise a weight or to turn a crank. The valves suggested and perhaps actually used by Huyghens for this purpose were sufficiently rude. They were nothing more than open but flexible leather tubes, which, after allowing the air to escape, were expected to collapse under the pressure from without, and prevent it from re-entering. Papin substituted for these a much more efficient and neater contrivance. This was to make an opening in the middle of the piston sufficiently large for the free escape of the air, and to cover this with a bell. The bell, yielding to the upward pressure, permitted the air to pass out, but, dropping immediately after into its place, effectually prevented its return. But none of these expedients sufficed to make a practically useful gunpowder engine.

In 1791, John Barber, a British inventor, patented a project for a new motive power, which may perhaps be regarded as embracing the germ idea of the modern inflammable-gas engine. This project, however, for it amounted to nothing more, was of the crudest sort. The motive force was to be derived from the drect action of a powerful current of flame, which he proposed to create by the combustion of inflammable gas mingled in explosive proportions with common air. The gas was to be generated by the destructive distillation of any combustible substances in a tight vessel. From the generator it was to be conducted into another chamber, called the "explosion chamber," common air being simultaneously introduced into the same vessel by a different channel. Under such circumstances combustion would of course be explosive, generating a powerfully outrushing stream of flame, which might be maintained as long as the gas should continue to be supplied. As the plan was only to employ the "*vis viva*" of this stream to turn a wheel or a windmill, the unpractical nature of the scheme needs not to be pointed out.

In 1794, another British inventor, by name Robert Street, patented a gas engine, founded on principles somewhat more rational than those which seem to have guided Barber, inasmuch as he clearly perceived that if heated gas is to be made the medium of applying mechanical power, it is through its elasticity, and not through the momentum of its mass, that we must expect to see the useful effect produced. But inasmuch as Street proposed to make the cylinder of the engine itself the generator of the gas by which the engine was to be driven, his scheme in a practical point of view was not a whit less visionary than that of Barber.

These early, and, as they seem to us now, absurd projects, though they bore no fruit, and were probably never even subjected to a serious experimental test, deserve mention in the history of this subject, as marking the progress of an idea destined at length to be successfully wrought out. Indeed, considered as an idea merely, it was successfully wrought out only a few years later. The gas engine, in every essential particular, such as it is at the present time, that is to say, actually realized in a form available for purposes of industry, was invented as early as 1799, and patented in France by an ingenious artisan named Lebon. Nevertheless, this machine was not a success. It attracted no notice in the scientific world, and inspired no confidence in the industrial. After the lapse of about half a century it was re-invented, and re-invented, doubtless, quite independently; the resemblance of the modern machine to that of Lebon being so complete that a description of one of them might easily be supposed to have been taken from the other. At the date of Lebon's invention illuminating gas had not yet come into general public use, but the mode in which he proposed to prepare the gas for his engine was precisely that which is now in universal use in the works of the great city gas companies. Having thus provided himself with a sufficient reservoir of this essential material, his plan was to introduce a certain charge of this into the cylinder of his engine beneath the piston, and simultaneously through another channel to admit a proper proportion of atmospheric air. The mixed gases were then to be exploded by means of the electric spark, their consequent dilatation furnishing the desired motive power. The inventor seems to have overlooked no provision necessary to secure the perfect success of his plan. The engine was entirely self-regulating. It operated two pumps, one of them designed to introduce the supply of gas, and the other that of air. According to the descriptions, by which only we know it, it would seem to have combined every feature important to secure success, and yet, as already stated, it was not successful. Its failure is probably to be attributed to the influence of several causes, which, in the progress of improvement in the industrial arts, and the simultaneous advancement of experimental science, have since ceased to exist. In the first place, as just remarked, inflammable gas had not yet been introduced for purposes of general illumination; and the preparation of gas for the engine must have been troublesome and disproportionately expensive. Electrical science, moreover, had not then reached such a state of perfection as to be in condition to suggest an apparatus for producing the spark required to inflame the gases, capable of operating with the unvarying certainty indispensable in such a machine; and finally, the mechanic arts were probably yet unequal to the requisitions of a problem involving the peculiar difficulties which the construction of this engine presented. In point of fact it can hardly be doubted that mechanical difficulties were among the principal obstacles which prevented the full realization of a project which, abstractly considered, seems to have been entirely feasible. Many other inventors since Lebon, have occupied themselves with gas engines. Until within the past ten years, none have succeeded in establishing their inventions in the confidence of the industrial world. Of machines of this class which have left no trace except in history, it is unnecessary here to speak with minute detail. There is one of them, however, which deserves a passing mention, as having been distinguished from the rest by a feature which may be characterized as more bold than practical. This consisted in the proposed substitution of oxygen gas instead of atmospheric air in forming the explosive mixture by which the piston was to be driven, and hydrogen instead of coal-gas; the proportion being that required to form water by combination; so that after explosion the vacuum of the cylinder might be complete. It is true that immediately after the explosion, the water of combination would exist in the state of vapor, and that this would have a momentary elasticity so great as, by its direct action, to drive the piston to the end of the cylinder. But this vapor would be almost instantaneously condensed, especially if the cylinder were kept properly cooled; and a vacuum being thus formed practically perfect, the piston, on the opening of the valves for the admission of a new charge of gas to the opposite side, would be urged by the full pressure of the atmosphere upon its entire surface. If this idea could be practically realized, it would certainly be attended with very sensible advantage. In the gas-engine as now constructed, there is necessarily a period during each stroke in which the effective force is zero. This is the case during a great part of the time of admission of each successive charge of gas, which continues for one half the length of the stroke. If during all this time there should be a vacuum in the opposite end of the cylinder, the engine, instead of being powerless, would be actuated by a positive working force upon the piston equal to one atmosphere; an advantage which more than doubles the efficiency as yet secured in any motor of this class. The project here described was patented by James Johnson, a British inventor, in 1841.

Mr. Tresca, in an interesting article published in the Annals of the Conservatoire, has expressed surprise that subsequent inventors have not occupied themselves more with this idea of Johnson. But in point of fact, the plan is much more plausible than feasible. To say nothing of the trouble and expense of generating the gases, which in the case of oxygen, especially, would be sufficient to defeat the economical object, the violence of detonation of the pure gases in the proportions suggested would be such as to endanger the safety of the machine, or to render the power unmanageable. It is also perhaps questionable whether, in practice, the condensation could be determined so as to take place at the moment desired. If the piston were free to take on the velocity of a projectile discharged from a gun, no doubt the pressure would follow it to the end; but if, owing to the connections by which the force is to be utilized, the motion of the piston is comparatively slow, the collapse may occur before it reaches the limit of its course. In such a case the vacuum would be injurious. In order to reduce the violence of the explosion, the quantity of gas employed in each charge might be diminished, and the charge might be allowed to dilate to some extent, as it would naturally do in consequence of the movement of the piston, before being fired. But these expedients would reduce correspondingly both the direct effect of the gas, and the indirect effect of the vacuum which it is sought to utilize. It is not very surprising, therefore, considering all the difficulties in the way, that no successful gas-engine has yet been constructed, deriving its power from the explosion of hydrogen with oxygen.

Three engines present themselves in the present Exposition which derive their force from the combustion of inflammable gas. Two of these employ the direct pressure of the gases as dilated by combustion. The third reverts to the principle which chiefly occupied the earlier inventors, viz., that of using the gases only as a means of clearing the cylinder of air, and rendering available the pressure of the atmosphere. It is to this last, which, though not earliest in the order of invention, revives the idea which belongs to the earlier period of this history, that attention will be first directed. This prominence of position may also be considered as due to this machine, since it was rewarded by the jury with a gold medal, while the other two just mentioned received a less honorable distinction.

Sewing Machines Driven by Electricity.

It seems that the subtile force of electricity, which has annihilated space in intercommunication, is now to be called in to ameliorate the condition of that large and meritorious class of community, women who support themselves by work with sewing machines, and to make the operation of the sewing machine in the family no longer a task but a luxury.

All who have witnessed the operation of Gaumé's Electro-Magnetic Engine, ourselves among the number, are convinced that it must eventually be largely employed as a motor for this purpose. And all philanthropists must join us in wishing success to an invention so well calculated to do good.

As we will shortly illustrate and describe this machine at length, we will not at this time enter into its details. Suffice it to say that the numerous obstacles which have barred the way to success in this field seem all removed, and that the cheap compact motor so long sought is at last obtained.

Although involving well known principles of electric science, there has been much ingenuity displayed in their application, and in its scientific as well as practical bearings the machine is well worthy of earnest attention.

The manufacturers of this machine are represented by Mr. H. C. Covert, 535 Broadway, New York, at which place the machine may be seen in operation.

The Hotchkiss and Buss Brick and Tile Machine.

This machine, a notice of which, with illustration, was published on page 337, Vol. XIX of the SCIENTIFIC AMERICAN, has, we understand, taken premiums at the Ohio, Indiana, and Missouri State Fairs, and at the previous Fair of the American Institute.

The machine is a low priced one, an important consideration for men of small capital. It is so constructed as to be exempt from damage by roots, stones, etc., and makes as perfect a finished brick as we have ever seen. The bricks are not pressed into shape, but are cut from a mass of clay, previously rendered homogeneous in the clay mill and formed into a flat sheet of the proper thickness. It is as well adapted to the manufacture of tiles as of bricks.

For the details of its construction we refer the reader to the descriptive article referred to, which will give a better opinion of the machine to practical men than anything short of inspecting it in actual work.

A very large saving over hand labor is effected by this machinery, and we regard it as worthy the earnest attention of practical tile and brick makers who are anxious to obtain a cheap, durable, and effective machine.

PROFITABLE FARMING.—A gentleman called at our office a few days since with a very ingenious machine for gathering cranberries, for which we are soliciting letters patent. While explaining his invention, he incidentally remarked that he had over one hundred acres of cranberry land which he bought some years ago for 50 cents per acre. He has recently refused $20,000 for eight acres. It should be bore in mind, however, that it cost a good deal of time and money to get the land in condition to bear the cranberry successfully.

Improved Apparatus for Printing Photographic Vignettes.

In order that the general reader as well as the professional photographer, may understand the nature and use of this ingenious invention, we will state in as plain a manner as the subject will admit, the nature of the difficulty which it is designed to obviate.

In the printing of large vignettes which have no definite border in order to secure the delicately-shaded background which gradually grows lighter as it recedes from the outline of the picture, until it finally fades out altogether, a device usually consisting of cloth or paper painted black on the side toward the blank, to obviate reflection, and having an opening through its center for the transmission of light from the camera, is held by the operator and moved to and fro to intercept the light from the outer parts of the vignette. These outer parts are therefore less acted upon by the light, and are softened off in the manner desired.

The operation is a tedious one, and very trying to the eyes of the operator, as it not unfrequently requires from four to six hours to print a large-sized vignette. It is obvious that a machine capable of moving the screen automatically and in the manner required, would be a very useful improvement, relieving the operator from a most unwelcome task, and enabling him to devote the time required to execute it, to other more agreeable and profitable work.

Our engravings exhibit such an improvement, and upon examination we are satisfied it will prove a valuable addition to photographic apparatus.

The working parts of the machine are inclosed in a wooden case, like the works of a clock. The door of this case has a slide in the center, covering a round opening, which is opened when in use, an opening in the opposite side of the case being provided with a telescopic tube and a slide. The door is shown thrown open in the figure.

Fig. 1

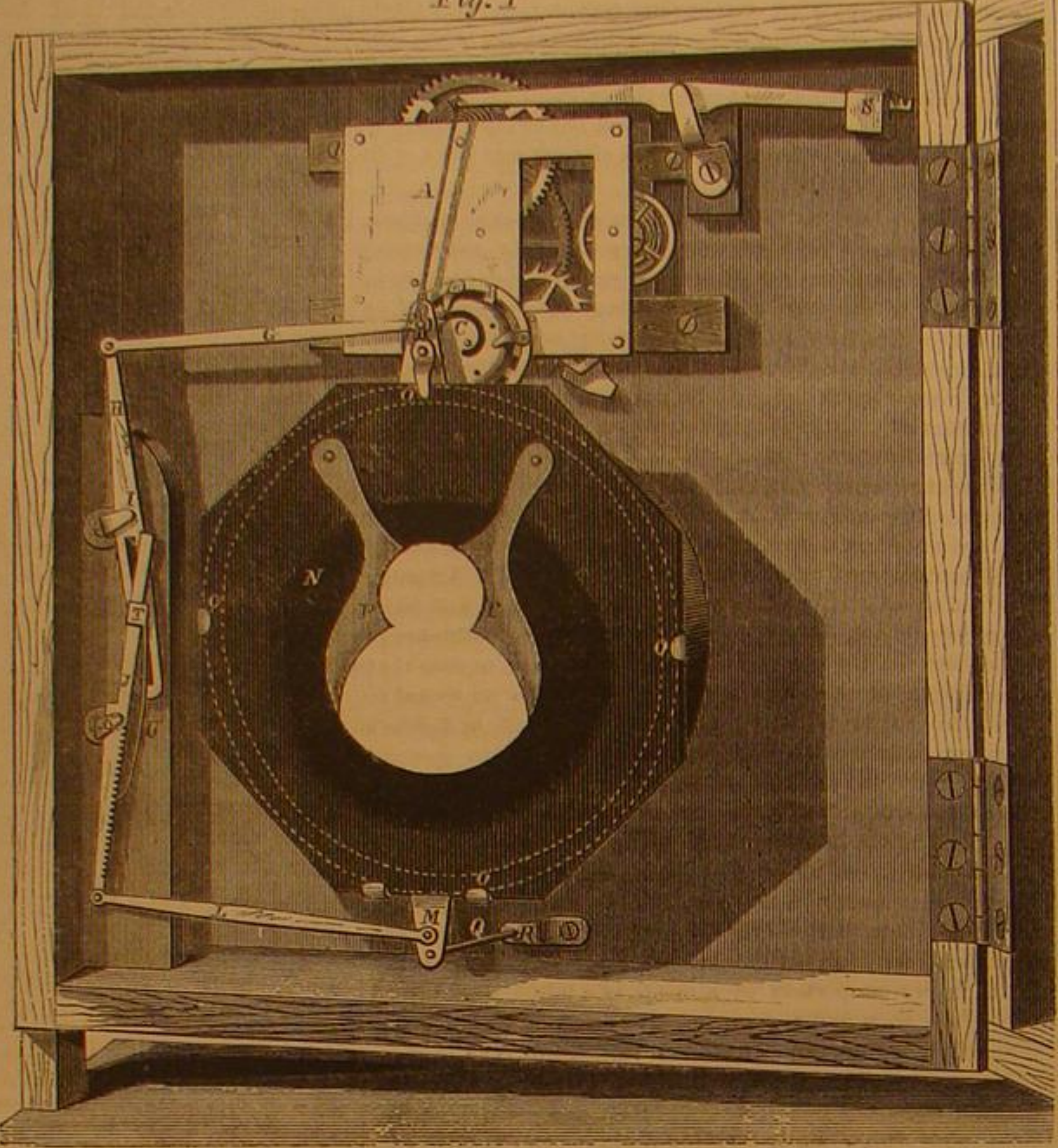


Fig. 2

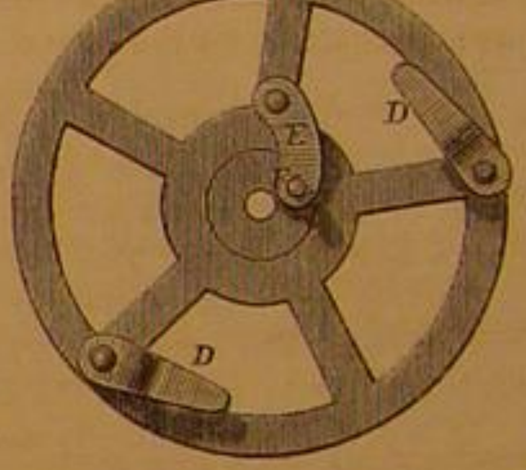
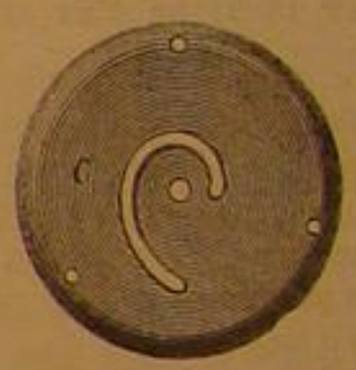


Fig. 3



JEAN ELIE RICHARD'S PHOTOGRAPHIC PRINTING APPARATUS.

In this figure, A is the front plate of the works of an ordinary brass clock, to the axle of the fourth wheel of which is attached the wheel, B. This wheel is shown in detail in Fig. 2. Upon the wheel, B, is attached a plate, C, also shown in detail at Fig. 3.

The plate, C, is of concavo-convex form, or what would be called in common parlance, dished; its concave side being placed next the wheel, B, and held there by the buttons, D, Fig. 2. A tongue, E, Fig. 2, is pivoted to an arm of the wheel, B, and at its opposite end it has a round stud, F, which projects through the curved slot of the plate, C, Fig. 3. The plate, C, also has a hole in its center, which, when C is placed upon B, fits upon the axle of B. It is obvious that when C is thus placed upon B, that partially rotating C, while B is held stationary will carry the stud, F, further from the center or contrariwise, so that anything attached to F, and moved by it will have greater or less motion, according as F is placed further from or nearer to the center of B.

Now, upon the pivot, F, Fig. 1, plays a hole in the end of the bar, G, the opposite end of G being pivoted to a rock-bar, H, pivoted at I, H in its turn imparting motion to another rock-bar, J, pivoted at K, J through the bar, L, imparting motion to M, the latter being a projection from an annular frame, the form of which is shown in the dotted outline on the screen, N, this outline showing the position of the frame behind N. From the top of the annular frame rises another piece of the same form as M at the bottom, and is pivoted to F in common with the bar, G.

It will now be plain that the motion imparted to the wheel, B, will also be communicated to all the parts described in proportion as F is set near to, or away from the center of B by turning the plate, C, on the axis of B.

To the annular frame, shown in dotted outline on the screen or diaphragm, N, are attached supports, O, which serve to hold N firmly to the annular frame and to give N all the motion imparted to the annular frame by the top piece pivoted to F, and the bars and rock-bars, G, H, J, and L. Wings, P, are pivoted upon the screen, N, so that the oval apperture in the center of N, may be reduced to the general contour of the head and shoulders of a figure in a vignette when desired.

A wire support, Q, is loosely pivoted to R and M, which preserves the relative distance between the annular frame and the screen when the apparatus is worked in a horizontal position, as well as when it is in the upright position.

A weight, S, acts through a lever and suspending wire as a counterpoise to the weight of the annular frame and the screen.

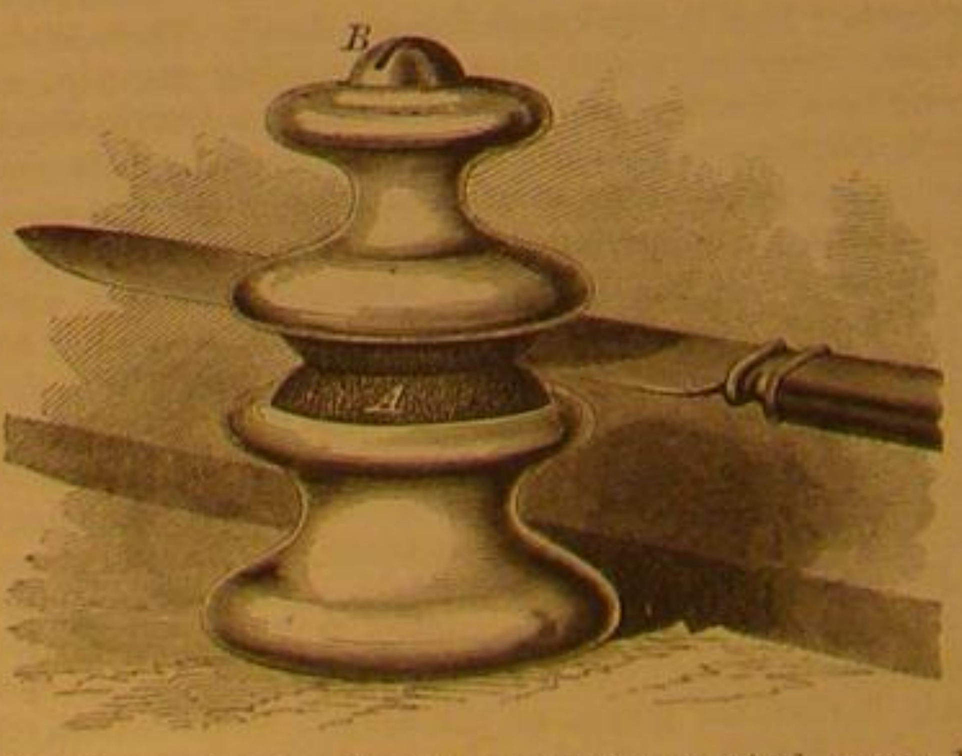
It will now be obvious that the revolution of the stud, F, around the center of the wheel, B, will be imparted through the bars and rock-bars, G, H, J, and L, to the annular frame and the screen, N, all the parts of the latter revolving around a center in the oval aperture through the center of N, the exterior edges of which will intercept the light on the exterior edge of the background of the vignette, and soften it, but without some further provision the machine could not imitate handwork, as it is frequently desirable to soften off the background more at the top than at the bottom, or *vice versa*. In order to do this the pivot which works in the slot in the lower arm of the rock-bar, H, and through which the rock-bar, H, imparts motion to the rock-bar, J, projects from a slide, T, which is adjustable upon the rock-bar, J, being held at any point desired by a spring pawl, U, which engages with a rack cut on the inner side of the lower part of J. When T is slid up near to the pivot, I, upon which the rock-bar, H, plays, very little motion is imparted to J and through it and the bar, L, to the lower part of the screen, while the motion of the top remains the same as before. When T is made to approach the pivot, K, on which the rock-bar, J, plays, the motion imparted by H to J is greatly increased, so that the bottom of the screen, N, is moved considerably more than the top.

By these ingenious means all the movements required to be made in the printing of a vignette are automatically performed, and with much greater uniformity and accuracy than is possible when they are done by hand. It exhibits great fertility of resource in invention, and its merit eminently consists in the simplicity of the means employed to secure the complicated movements required.

Patented through the Scientific American Patent Agency, August 17, 1869. For further information, address, for two weeks, Jean Elie Richard, patentee, Sweeny's Hotel, New York city, after that time, Columbia, S. C.

IMPLEMENT FOR SHARPENING KNIVES.

Our engraving illustrates a convenient little implement for sharpening knives. The top and bottom pieces are of porcelain, the bottom of the top piece and the top of the bottom piece being recessed to admit the convex emery disks, A.



The two parts are held together by a vertical screw, B. In use the left hand grasps the top, and the bottom is pressed down upon a table. The edge of the knife to be sharpened is then drawn by the right hand through between the emery disks, the convexity of these disks, enabling a strong pressure to be brought to bear upon it, and, as a consequence, a rapid action upon the blade is secured.

Its appearance is tasteful, and it will be found a desirable substitute for many of the implements heretofore used for this purpose.

For further information, address W. H. Howland, 26 West Washington Place, New York city.

Steering by Steam.

A correspondent who was present at the occasion of a recent trial of the steam steering apparatus with which the small steamer *North Star*, of Muskegon, has been supplied, writes to the *St. Louis Dispatch* as follows:

The experiment was such a complete and marked success mechanically, and seems in its principle to foreshadow such immense benefits to steam navigation, that it deserves the earnest and instant attention of the public. While the arrangement of the machinery connected therewith is simplicity itself, the result on the motions of a vessel are instantaneous, and as powerful as can be desired. Instead of a cumbrous wheel in the pilot house, a lever like the starter of a locomotive stood up from the floor, which worked either way from side to side by no heavier pressure than could be given by the thumb and finger, but which made the *North Star*, a long, narrow river boat, almost turn on her centre, and then as instantly reverse with the same promptitude of action on a different application. A doubt having been expressed as to whether, by the same machinery, she could be "held" on the same steady course for a length of time, the steersman fixed on a mill chimney two miles distant, and made for it. After getting her from the previous violent swayings into true line, he dropped the bar and let her run for it, until all on board were satisfied of the truth of her course. Where the steam rudder is left there it stays, and no power less than that able to overcome all the steam force of the boilers can shift it till again manipulated by the lever.

Numerous experiments were made in turning, backing, twisting, and all with astonishing results. When standing still the rudder could be put down with such force as to swing the vessel a point or two. I really believe that, had such an apparatus been on the *Milwaukee* and *Lac La Belle*, when they met on the St. Clair flats, even at the late moment when the dire warning note was sounded, collision could have been easily avoided. The whole steam power of the vessels thrown instantaneously (as is possible) upon the taut wire rope rudder lines, it would have swung them so as to merely rub sides, if they touched at all. I have watched with admiration, on the rapids of the St. Lawrence, the old Indian pilot with his half dozen brawny assistants, grouped around the mammoth wheel, as with lightning speed he shot the long sault or plunged the cascades. I have watched his quick, nervous action and word of command so quickly sounded by his assistants, and wondered what our fate would be should these men mistake, even for an instant, larboard for starboard. But with a machine like this the doughty old red-skin could stand in all his native dignity alone, and with one hand, unaided, as lightly as a feather, make the steam power, as prompt as telegraph, work his wayward and oft-changing will, and swing his steamer as quick as changing a top.

Another beautiful contrivance connected with this, and one as much to be appreciated by the traveling public as the steam rudder by the regular marine, is what the patentees technically term the "life lines." If you will call back to memory almost any marine disaster from burning, either at sea or on our inland waters, you will readily recollect that generally the most painful and terrible portion of the calamity began when the ship lost steerage way and was going adrift—going any and every way before the wind. From the *Henry Clay* on the Hudson, to the *Sea Bird* on Lake Michigan, it has almost ever been the same story; a pilot-house deserted; a vessel unmanageable; refuge within almost easy reach, impossible of attainment by lack of steering power. This apparatus provides continuous communication from stem to stern, by which the vessel can be managed from any part of the deck. When the pilot-house gets "too hot to hold him," the wheelsman can take hold at the next cool spot. If the stern is in flames he can steer from the bow, and *vice versa*. as long as there is a bit of deck left the iron life-line is there, and until it melts the communication is as complete.

INVENTORS who contemplate taking out Letters Patent should read the instructions given in another column, which fully explain the system upon which the proprietors of this journal manage their extensive Soliciting Agency. We are always happy to advise with inventors, and will furnish them all the necessary instructions how to proceed upon application to us, either in person or by letter. Inventors and patentees will find at our office the Official Patent Reports, Decisions, and Claims, which they are at liberty to examine. We shall be glad to afford them every possible facility.

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WHAT IS TO BECOME OF OUR BROWN-STONE FRONTS?

One of the most striking features of modern American building is the great favor with which the material known as brown sand-stone or brown free-stone is regarded. It is a rich colored sand-stone admirably adapted to the production of fine architectural effects; it is cut with great facility and is not too expensive; yet notwithstanding these great advantages it lacks an essential quality of all good building stone—durability.

We have noticed lately several articles upon this subject, which would, independent of our own observation, have convinced us of this; but as long ago as 1854 we asserted that this stone could not endure our climate.

Since that time we have made numerous observations, all which have confirmed the opinion then formed. It is rare that the condition of brown stone exposed fifteen or twenty years to the action of weather cannot be expressed by the word "scaly;" and we were assured once by an extensive builder who has in his life erected a great many brown stone fronts, that in his opinion the life of the fronts would not without repairs, average over thirty years.

We have in mind a large building in which this material was employed and which has stood certainly not more than fifteen years, yet which now exhibits unmistakable signs of incipient decay. Nothing was omitted to make this building permanent but a proper selection of material. Fifteen years more unless the crumbling blocks shall be taken out and replaced by new ones will certainly make sad inroads into this costly and elegant structure.

A writer in *Appleton's Journal* has recently called attention to the condition of Trinity church in this city which he states to be in a state of incipient decay, though confessedly built of the best brown sand-stone this country affords. He also calls attention to the ultimate result of this decay as shown in the tablets and tombstones of old cemeteries, that of Trinity church in particular. Here, he remarks, "rough, unsightly slabs will be found, which once were tablets, recording the virtues of the mortals whose memory they were intended to perpetuate; yet now they stand, and that is all, a collection of scarcely cohering strata, ready to fall in fragments at a touch. The greater exposure of these stones has but accelerated a result which will be the fate of all things in which this material is used."

The writer of the article referred to, concludes as follows: "The present generation will scarcely see the palaces of our millionaires transformed into seamed and broken ruins; but what will be the condition of these buildings a hundred years hence, or even in fifty years?"

To suppose that our architects have been all along ignorant of the defective character of this stone would be scarcely more complimentary than to suppose they had encouraged its use in full knowledge of its deficiencies for the sake of gain. One or the other of these suppositions must, however, hold good. It can hardly be supposed that such material would have been placed in the many costly brown-stone churches to be found in this country in the face of an earnest protest from conscientious architects. Such protests would be likely to be regarded also by private individuals about to erect mansions for their own use, however little they might have availed when made in reference to buildings erected by the general, State, or city governments.

The history of the latter class of buildings has been one of shameful jobbing, in which private interests have nearly always been considered as paramount to the public welfare.

It is time that in American architecture the element of permanency should begin to be considered. Hitherto there has been some excuse for temporizing and there may still be the same excuse in new and rapidly growing cities, in which the changes twenty or thirty years will produce can hardly be predicted, but in older cities like New York or Philadelphia it would seem that no element of uncertainty need remain to interfere with the adoption of a solid and substantial method of building, in which mere outside display should not override every other consideration.

BOILER EXPLOSIONS.

So long as the use of steam continues to extend, and the causes which lead to explosions are permitted to remain, the number and frequency of these disasters must be expected to increase. In reading the reports of boiler explosions which almost daily reach us, we find a very large proportion of them referable to causes in no way connected with the original construction of the boilers, but to causes which have come into existence through carelessness or mismanagement. Here a valve is stuck fast, and there a piece of bungling patchwork has been applied, or a boiler has been altered in form and the stays removed in the alteration have not been replaced, although the change may have made them all the more necessary. In another case the boiler may have been over-heated, and so on through the entire category of causes of danger too well known to be dwelt upon at length. Now either the conditions under which a boiler may be safely worked are too manifold and complex to be complied with, or there is gross culpability connected with nine tenths of the explosions which occur. If, like nitro-glycerin, a boiler were likely to explode under the most ordinary circumstances of treatment, if it were a matter of extreme difficulty to secure proper care in their use, and when every thing had been attempted to secure immunity from explosion, the risk remained that there might still be something left undone, which, if undiscovered, would render the previous caution of no avail, there would be more excuse.

But this is not the case. A well-constructed boiler is not essentially such a terribly destructive agent as to endanger the lives of all who come near it. The conditions of safety are few and easily complied with. The care demanded in its use is not more than can be easily given, and the want of proper attention to the simple requirements of the case can be regarded in no other light than that of criminal neglect.

It is not our intention to enter upon the much-discussed topic of the ultimate causes of boiler explosions. There are certainly cases wherein all the conditions of safety seem to be fully supplied, and yet explosions occur. In such cases we must look for causes among those which have been treated by various authors and which we believe are mostly faults of construction. No amount of care can obviate dangers from this cause, but we have already said that cases of this kind are comparatively rare.

If, then, want of proper care in the management of boilers be admitted to be criminal, we submit that there should be a severer code adopted to enforce proper care. A proprietor should not be permitted to run a boiler which is in an unsafe condition, and ignorance should not be allowed as a mitigation of neglect.

There ought to be a system of rigid inspection adopted in this country, and it should be enforced by law, the expenses of which might be defrayed by paid licenses from the owners of boilers, who should be prohibited from running a boiler a single day after it is condemned by the proper authorities. Any violation of this law should incur severe penalties.

We have a system of inspection for marine boilers, but there are hundreds of boilers on land to one on water, and many of them are in charge of men who are utterly unfit for the work. Whatever of supervision exists under the present system—and, if we mistake not, there is something of the kind provided for on the statute books of most of the States—it is certainly very inefficient; so much so as almost to amount to nothing. This is not only evident from the number of explosions which occur, but still more evident from the condition of a large proportion of the stationary boilers scattered over the country.

It is time this matter was more vigorously taken in hand, and some efficient efforts made to reduce the number of accidents arising from this source. It would not, it seems to us, be difficult to draft a law providing for systematic inspection and summary action when compliance with its requirements should be refused.

IS THERE SUCH A THING AS SOCIAL SCIENCE?

There is a great deal said, now-a-days, under the captivating title of "Social Science;" but much of what is said and written warrants a doubt of even the existence of such a science. Still more does it warrant the doubt that those who attempt the discussion of social topics, have, even admitting the existence of such a science, ever mastered the first rudiments of it.

The wordy and weak discussions which have filled up the time of the so-called "Social Science Conventions," have not availed to fix public attention upon social evils more strongly than before they were uttered. The few suggestions made for reform, and the correction of acknowledged existing evils, have been of the most impracticable kind, and showed most glaringly superficiality of thought in those who offered them. If there be not now, it is high time there ought to be such a thing as social science.

It is painfully evident that society is, in some respects, going from bad to worse. We will not say that, on the whole, it is deteriorating; but granted even that it is growing in virtue and increasing in knowledge, that its sanitary condition is improving and its moral health better than in the dark ages—all this is not enough.

It is sad to reflect that whatever progress has been made, or is now making, is the result of bitter experience to those who have gone before us, and whose blood and tears have stained the pages of history for ages.

Is there no way to adjust society on immutable principles? Must all progress be in the future as in the past secured by experiment? And must what we call social science be forever a mass of ill-assorted facts culled from history? Surely there is some more solid basis than this for social organization.

Did we want proof that nothing like social science exists among us, it is found in all that surrounds us. Very little that passes current in society will stand the test of reason. Our eating, our working, our dress, and even our sleeping, are alike performed with a general disregard to physical law. Pauperism has become a profession. Disease though on the average, perhaps, not so deadly as it was a century ago, is, if not more general, still not less diffused. Perfectly healthy people are the exceptions, not the rule. The professions of law and medicine still find enough in the misery and crime of humanity to amply sustain them. The administration of justice is too often a mockery, and legislation has become a matter of barter and sale. The drones of society are on the increase, and honest hard-working producers are compelled to contribute to their support.

Could these things be if social organization had been reduced to a science? Blackstone, in his "Commentaries," has laid down some general principles upon which all society must be based, and any departure from which is a step toward anarchy; but these principles underlie the civil rights of people united in a national compact. They leave untouched great and fundamental physiological and biological laws, the disregard of which has burdened society with the greatest evils under which it now groans.

Until some prophet arises capable of grappling with this subject from a physical and biological, as well as a political and legal point of view, and beginning down upon hardpan, shows how society may be constructed in harmony with all the conditions of pure living, regardless of creeds, conventionalities, or traditions, let us not flatter ourselves that such a thing as social science exists. A heterogeneous mass of facts does not constitute a science, any more than a rude heap of stones and sand and lime may be called a temple.

MICA BROCADES—A NEW PRODUCT OF ART.

No doubt all of our readers are acquainted with the mica which is so extensively used in doors of stoves. But it may be stated that under this term a whole group of minerals is comprised, either occurring massive or disseminated in rocks. They have all a more or less foliated structure and pearly luster. They are elastic, transparent, or translucent, and have a specific weight of 2·7. In Germany mica has recently found application for the production of bronze-like colors which bear the names "brocades," "crystal colors," and "mica bronzes." The mineral is to this end well crushed, boiled in hydrochloric acid, then washed with water, and assorted according to the size of the laminæ. Mica scales thus obtained exhibit a glass-like luster combined with a silver-white appearance. The advantages of these brocades (which by the way may be colored) over the ordinary metallic brocades, are stated to be the following: 1. They do not contain any ingredient injurious to health. 2. They possess metallic luster like the ordinary brocades, and some surpass them even in liveliness of color. 3. Brown, black, blue, green, and rose are obtained in remarkable beauty, which is not the case with the metal bronzes. 4. They comport themselves with perfect neutrality toward sulphurous exhalations. 5. Their specific weight being very slight, their yield is consequently correspondingly great. In their application they may be fixed upon all kinds of articles of metal, wood, glass, plaster-of Paris, and paper board. They are consequently well adapted to the preparation of artificial flowers, fancy papers, sealing-wax, in tapestry, furniture-making, and painting. Theaters may employ them for imitating gold-rain and snow, for which purpose they recommend themselves on account of their lightness and cheap price. In short, they may be used for almost all the purposes to which the ordinary bronze powders have been applied. In fixing these brocades upon articles of any kind it is advisable to paint them first with a color similar to that of the bronze; for silver, a ground of white lead is suitable; for blue, one of ultramarine, etc. They are equally suitable for oil and glue colors, which latter are fixed with a mixture of four parts of glue and one of glycerin. Upon this coat, when hard, the binding material for the brocade is spread, and after one quarter of an hour this latter is sifted over. As binding material a paste, consisting of four parts of boiled starch and one of glycerin, is recommended. If desirable, the powder may be finally pressed down with a roller. If the ground is formed by an oil paint, the binding material for the brocade should be constituted of a dammar, or pale copal varnish, upon which, when only pitchy, the powder is sifted over. When finally coated with a suitable spirit, dammar, or copal varnish, the so-prepared articles assume a luster which, in beauty and durability, far surpasses any heretofore obtained with the common bronzes. When small particles of mica-silver are spread over articles coated with asphalt varnish, the result is a good imitation of granite. The crystal colors are also suitable for calico printing, and fabrics upon which they are applied, surpass in brilliancy the heavy bronze and glass-dust fancy fabrics from Lyons. Employed between or on colored gelatin plates, they give rise to superb crystallizations, which are used as inlayings for buttons and various other articles. They may be spread over finished porcelain and glassware, if these are heated again to the fusing point of their glazing.

According to Dr. C. Cech and L. Schneider, in Prague, these brocades may be colored with the following dye stuffs: Rose, with a decoction of cochineal; carmoisin, with the bluish magenta red; bright red, with fuchsine and Havana brown; violet, with Hofman's violet. A solution of Prussian blue in oxalic acid, serves for producing a bright blue, and Girard's violet for deep blue; light and dark green are imparted by aniline green and curcuma; gold with curcuma, dark brown with a proper bark extract, and black with litmus and haematoxylin or logwood extract. Silver needs no color. According to Dr. L. Feutchwanger's (*vide* his popular "Treatise on Gems"), mica is found in this country at Williamsburg, Mass., Hartford, Conn., and many other places. The green mica, which is of a beautiful grass-green color, is found in Brunswick, Me. The rose-red mica, which is also a very beautiful mineral, is principally found at Goshen, Chesterfield, Mass., Acworth, N. H., Bellows' Falls, Vt., etc. Mica, according to the above named mineralogist, when of good colors, may be used for jewelry and other ornaments.

POLAR EXPEDITIONS.

A difficult problem has a charm, by very virtue of its difficulty, which will attract and fix the attention of a certain class of mind. It is, moreover, a class of mind the world could ill dispense with, and which has conferred innumerable benefits upon mankind. It is mind which grapples with all questions, without regard to practical applications, is content to seek knowledge solely for the sake of knowing, leaving the useful applications of its investigations to another class of mind altogether. It is not inventive, but curious. It is sufficient that a thing is obscure, to secure at once the most ardent effort at solution from men of this class of mind.

Of such sort is the intellect now grappling with what may be called, when its difficulty alone is considered, the great geographical problem of the age.

It is hard for men of practical and inventive minds to see what earthly benefit can ever arise from these explorations, yet it would not be prudent to assert that no benefit could ever accrue, and many of the most proud mechanical, engineering,and chemical achievements of modern times have had for their germ, investigations seemingly as hopeless and impracticable as this.

Scarcely any scientific or literary periodical falls under our notice that does not bestow more or less of its space upon the subject of polar exploration.

Putnam's Monthly, for November, contains a long and interesting article on the "Gateways to the Pole," which maintains that the only true solution of the problem is that of Capt. Silas Bent, of "Japan Expedition fame," as put forth in an address, delivered by that navigator, before the St. Louis Historical Society. The date of Captain Bent's address is not given.

The author conceives "the true Arctic pr blem to be, not whether there is a passage to the pole." but "*Is there a permanent and navigable way to the pole?* This question is answered in the affirmative by Captain Bent, who, in the absence of direct confirmatory experience, undertakes to prove, that, from the very nature of things, such a passage must exist.

While we grant that the vast amount of heat, which passes into the sea at the equatorial regions, and passes to the north in the waters of the Gulf Stream, in the Atlantic, and the Kuro-Siwo, in the Pacific, would favor belief in the existence of open passages through which these waters find their way to the Polar Basin; yet to argue, that because a thing is probable, it is real, seems more speculative than sound. The scientific world will be slow to accept the two "gateways" of Captain B nt till somebody finds them unlocked. This aspirant for Polar Honors not only believes that these avenues actually exist, but, to use his own language, "the only practicable avenues by which ships can reach that open sea, and thence to the Pole, is by following the warm waters of these streams into that sea; and that to find and follow these streams, the water thermometer is the only guide, and that, for this reason, they may be justly termed 'the thermometric gateways to the Pole'."

One would suppose, that if open and navigable passages really exist, they might be seen as well as determined by the thermometer. This latter, it strikes us, is what might be called feeling our way to the pole.

We regard continuance upon the surface of the great streams alluded to, as entirely an unsettled question. The natural effect of heat upon the specific gravity of water would, if not counteracted by other influences, certainly keep these currents at the top; but who shall say, in the present state of our knowledge, that such influences do not exist.

Com. Rodgers made extensive deep-sea soundings in the Arctic Ocean, in 1856. He uniformly found warm and light water at the top, cold and heavy water at the bottom, and warm and light water again beneath the cold middle stratum. An important fact was also discovered in these soundings, namely, that the outflowing surface currents were salter than the middle stratum. It is inferred from this fact, that the water in these surface currents flows into the Polar Basin in under currents,from regions where much evaporation is going on, and where, consequently, a greater proportion of salt exists in the water than in other parts of the ocean.

The subject of an open Polar Sea is discussed in Maury's "Physical Geography of the Sea," Chapter VII. It is there stated, that an under current setting into the Polar Basin exists in Davis Strait, with a corresponding surface current flowing out. It is also a common thing for Arctic navigators to throw out an anchor upon icebergs floating north, impelled by these under currents, and thus get their vessels towed north gratis by these ice tugs. Dr. Kane, in his narrative, gives a most graphic description of an adventure of this kind, whereby he secured consid-rable progress in spite of a head wind and strong opposing surface current.

These facts show that Captain Bent's opinions are no less speculative than those of others who have preceded him. No amount of reasoning will convince thinking people upon this subject, no matter how plausible it may seem at first sight. Of all problems, the solution of which must depend upon actual experiment, this one, obscured as it is by a multitude of unknown conditions, must be regarded as the chief.

THE CARE OF HOUSE-PLANTS.

The recent frosts have admonished all amateur and professional horticulturists to remove all plants intended to be cultivated in the green-house or conservatory during the winter, from their beds to pots. We find in *Tilton's Journal of Horticulture*, a very seasonable article, from the pen of Wm. F. Channing, M. D., on the care of "house-plants," which will be of great service to those who have neither green-house nor conservatory, and who, notwithstanding, desire to preserve and enjoy the companionship of their summer favorites.

"How to make plants grow in the house is a much more important question than how to make them grow in the green-house. Few persons have conservatories. Almost every person has a window at which the spring and summer of plant-life may be fostered and maintained during the long winter months.

"Formerly almost every house had its plants. The children and the flowers were the chief ornaments of the old homestead. During the last generation, or since the introduction of furnaces and gas, the cultivation of plants in our houses has steadily declined. I propose now to show that this great depriva ion and loss to our modern houses is unnecessary, and that plants may flourish as well under the dispensation of gas and the furnace as in the days of the old wood-fire and mold-candles.

"It may be true that plants will not grow in an artificially desiccated air. The skin and the delicate membranes of the throat and lungs parch in the dry furnace heat just like the leaves of the plants. The freshest complexion becomes wizened by a winter of this sirocco. What then shall be done in our furnace-heated houses? Simply introduce evaporators, which shall furnish to the air at least one-half as much moisture as the air naturally contains at the same temperature in spring or summer. The shrinking of the wood-work of the houses, or warping of furniture, are indications of an unnaturally dry heat, which is fatal to plant, and injurious to animal life.

"It is true also, that plants will not thrive in close rooms, charged with the sulphurous acid escaping from the combustion of anthracite or a product of combustion of impure illuminating gas; and in the same atmosphere the throat and lungs of human beings will suffer more or less severely. What is the remedy? Open a ventilator into the chimney, near the top of every room, if you can do no better, and keep it open, at least during the evening, while the gas is burning.

"I am prepared to say that furnace-heat and gas-light are no obstacles to the cultivation of plants, observing only the precautions which are equally essential to human health. I think the rule should be broadly stated, that any room in which plants refuse to grow is unfit for human life.

"In this connection, it is proper to enter a protest against the barbarous habit of excluding the sunshine from inhabited rooms, especially in winter. Its effect is almost as depressing on children and delicately organized women as upon plants.

"There is one other obstacle to the growth of plants in the modern house; which is the plague of insects. Some varieties, especially the microscopic red spider, are uncontrollable in a dry atmosphere, but retire at once before proper evaporation. For the rest improved resources of which I may speak at another time, make it tolerably easy now to keep house-plants free from parasites.

"To illustrate theory by fact: I heat a moderate sized house, containing about twenty thousand cubic feet, with a furnace. I find it necessary to expose seven square feet of evaporating surface in the air chamber of the furnace to produce a proper degree of atmospheric moisture. Half this surface would answer with better exposure. About a pint of water is evaporated in twenty-four hours for each seven thousand cubit feet in the house, in raising the temperature from 40° to 70°, two pints in raising it from 30° to 70°, three pints in raising it from 20° to 70°, and four pints in raising it from 10° to 70°, and about five pints in raising it from zero to 70°. Thus, in the extremest of cold weather, it requires nearly six pails of water in twenty-four hours to keep the atmosphere of the house soft and agreeable though not appreciably moist; that is, not nearly as moist as the ordinary summer air at 70°.

"At twelve windows north, east, south, and west of the house thus heated, I have about seventy plants, mostly of the common kinds in very fine condition. During several years I have never known them to be injured by the furnace-heat and never by the gas, freely consumed, except in a single instance of an ivy growing near the ceiling of the room during an accidental leaking of gas.

"I find that ivies thrive peculiarly under the conditions described, growing well in positions furthest from the light; as, for instance, on the hearth, forming a magnificent fireboard. Six or eight varieties of variegated leaved ivy thrive well with the common. I find that roses which have blossomed during the summer in the ground, being potted after hard frost, stripped ruthlessly of every leaf, and trimmed in almost to bare poles are covered with buds within a month at my window, and blossom all winter, great authorities to the contrary notwithstanding. This winter a Madame Bosanquet has left all the r st, showing buds in three weeks, closely followed, however, by the Agrippina Souvenir de Desire, Sarfano, Hermosa, and Sanguinea.

"The Chinese-primrose, and coral-drop begonia are never out of blossom with me in the winter. A heliotrope, occupying a whole window, gives hundreds of its clusters, beginning in December. The orange, lemon, myrtle, and diosma grow with the greatest ease; and the Daphne odora and laurustinus blossom in their season. Among other plants which I find it good to have in the house, I will mention the varieties of winter and spring blooming cactus, geranium, oleander, abutilon, calla, Tradescantia zebrina (large and small leaved), hoya, maurandia, tropæolum, saxifrage, Coliseum vine, Maderia vine, and the usual bulbs."

[We would add to the valuable suggestions of Dr. Channing that a most excellent plan recommended by an accomplished florist, and used by us with great success, is to saturate sponges with water and place them upon plates around and among the plants and underneath the stand. A liberal use of these greatly assists in neutralizing the effects of dry heat.—Eds.

The New Thames Tunnel--How the Work is Carried On.

The new Thames Tunnel has progressed so fast since our last notice, that it may now be said to be virtually complete, and will, it is expected, be in a fit state for opening for public traffic about the middle or the end of next month. The whole length, from what may be called the summit of Tower Hill to the end of Vine st., in Tooley st, on the south side of the river, is just 1,320 feet, and of this distance more than 1,280 feet has already been accomplish-d and complet-d. Only about forty feet remain to make the junction with the Tooley st. shaft. This short distance, at the rate at which the tunnel has advanced, could be accomplished in about four or four and a half days, but the shaft itself cannot be ready within that time, nor, indeed, is it likely to be ready within the next fortnight. The shaft in Tooley st. is not so deep as that at Tower Hill by two ft. The former is to be fif y-eight ft., whereas the l tter is sixty ft. Yet the Tower Hill shaft was sunk quickly and without the smallest difficulty, for, after passing through about twenty ft. of made earth, the clay was reached, a little below, and not a sign of water was detected. What we may call the Tooley st. shaft is a litttle over ten ft. diameter, and has been sunk to a depth of about twenty ft., where it has come upon a bed of gravel,in which the water is more abundant than could be wished. It is not, however, in sufficient quantity to prevent the shaft being very easily kept dry by means of pumping,but pumping is by no means wished in this case, for the shaft is near some very large buildings, and to pump out much water from beneath them would have the effect of causing their foundations to sink rapidly as the gravel beneath them was diminished in bulk as the water was drawn off. The Tooley st. shaft, therefore, is being sunk by means of a peculiar screw, which is called a "miser," an instrument used in works of this nature, and which brings up the maximum of gravel with the minimum of water. In this way the works are progressing steadily. As far as this shaft has yet gone, it is double lined with iron casing, the inner rim of iron keeping out the leakage which may find its way through the joints of the outer. These iron rings of the shaft are four ft. deep each, and they are forced, by weights, down into the soil before much dredging out within their circumference is attempted. The double iron lining to this shaft will not, it is expected, be continued to a much greater depth than it is at present. There is every sign that the water-bearing stratum has been nearly passed, and that the clay will soon be reached. When this is attained, only one lining of iron rings to the shaft will be used to within a few ft. of the bottom, where bricks, faced with glazed tiles, to reflect the light, will be employed, as in the shaft on Tower Hill. Night and day, every four hours, the shield driving the tunnel,moves forward eighteen inches, so that there is an advance of nine ft. every twenty-four hours.

The manner in which this rapid advance is accomplished is as simple and ingenious as it is safe and quick in its mode of operation. The shield is a disk of mixed wrought and cast iron, weighing about two and a half tuns. In the front next to the clay, it is concave; in the rear, where the men work, it looks like a gigantic cart wheel, having six spokes and an enormous open hollow felly in the center. To this shield, and extending backward over the men at work, is a powerful iron rim, just like the cap to the end of a telescope. Thus, the miners who work it excavate enough clay through the center opening to enable one man to pass in beyond the face of the shield, and he soon cuts away clay enough to find room for two, and when a comrade joins him, there is soon room made enough for three workers, but seldom for more. The clay is of the kind well known as the stiff London clay, of a blackish green color, just moist enough to give it a thorough tenacity, but without any water. When about two feet have been ex avated all round in front of the shield, the miners return back through the central hole, and, with ordinary hand-screws, they force the shield on to the length of the distance they have excavated, its long rim still keeping them under shelter as it is advanced. Within this rim a segment of the iron tunnel is at once built in three segments, eighteen inches long, and so on, the process is repeated over and over again. The inner face of the shield is so constructed as to receive the pressure of six screw-jacks—one in each of the six spokes we have spoken of. By these means a pressure of sixty tuns could be brought to bear on the whole shield. As a rule, however, one screw-jack and one man is sufficient to move it forward, and this with ease. In case of any water being come to—such as a spring—for the whole tunnel is far below the bed of the river water—it would give indications of its presence in the moisture of the clay long before the miners reached it. In the course of the excavations of the shield, about 2,000 cubic yards of the London clay have been dug out for the tunnel alone. This, as fast as it was cut out, was run out in little "trolleys," to the Tower Hill shaft, and hoisted up to the outer air. But every "trolley" dropped its quantum in the tunnel till the base of the tube became covered with some six or seven inches of sticky, wet clay. This has all been removed, and the tunnel, as far as it has gone, is now clean from end to end.

The result is, that all that passes on the river over head is ten times more distinctly heard than ever. The passage of a steamer is heard with a noise so loud and vibrating in the at present confine' air of the tunnel, that it is only the knowledge of the unalterable and almost immovable strength of the structure in which you stand that gives the hearer confidence. Not only can every vessel be heard passing—we speak of course of steamers, large or small—but even such slight noises as hammering on the ships in the Pool above can be distinguished not only by the sound, but even by the slight though perceptible vibration of the air. Yet, the whole tunnel is not only water-tight but air-tight. The tests taken for deflection, or any settlement in the iron tube, since it has been built, give results that show a stability that apparently nothing but an earthquake can unsettle. The greatest deflection was only one eighth of an inch from the true level, and in only two instances was it one sixteenth. As far as regards the tubes bearing pressure, they are equal now that they are formed in circles, to about ten times the pressure they can possibly have to bear, and to more than twenty times the pressure that is now laid on them. Altogether about 864 rings have now been laid and bedded in with blue lias cement. About twenty more rings will complete the entire tunnel from Tower Hill to Tooley st. The descent down the shafts will be by means of lifts. These are to be constructed on a special design of Mr. Barlow's, so as, in case of accident, such as the giving way of any of the apparatus, to clip the guiding rods and check the progress of the lift in a few feet. This invention, in fact, is only a very clever break, which, instead of acting instantly, and with a sudden jerk, as bad as a fall, slowly brings the lift to a standstill in about ten ft. This arrangement has one especial merit, which is, that it is never likely to be called upon; for the wire rope which is to raise and lower the lift is to be about fifty times stronger than its supposed strain, so that there seems very little chance of its breaking with the weight of ten people, when it has been tested to bear more than the weight of a hundred. The lift is to be a mere little iron room, built to hold ten people with comfort, though, from the ample space intended to be allowed, it might hold twelve with almost equal ease. The omnibus at the foot of the shaft is to hold fourteen. The time of transit from Tower Hill to Tooley st. is to occupy three minutes, and the fare is to be a penny.—*London Times.*

HORSFORD'S PHOSPHATIC BREAD.

RUMFORD CHEMICAL WORKS *vs.* JOHN E. LAUER.—In this case, tried before Judge Blatchford, it will be remembered a decision was given against the plaintiff on the first claim, on the ground of want of novelty; it being contended by the defense that a pulverulent phosphoric acid was made by Berzelius under the name of three fourth's phosphate as early as 1816. The plaintiff maintained that the three fourth's phosphate of Berzelius was used for making bread, and moreover that the experts for the defense had not made the three fourth's phosphate, nor had they followed the process of Berzelius.

Since the decision was rendered the chief witness for the defense has found that he was mistaken, and it appears that there is no evidence in the case impairing the claim for originality by the patentee.

Upon affidavits setting forth these facts, the Judge has ordered the case to be re-opened for further testimony, and a new hearing and a new decision. For particulars respecting the trial, see page 105 of the present volume of SCIENTIFIC AMERICAN—"When Doctors Disagree, who Shall Decide?"

Enormous Sale of Newspapers.

The *Herald* publishes a tabulated statement of the sales of newspapers in New York city for the six months ending September 30th, from which it appears that an aggregate of six million dollars' worth of city newspapers was sold in that time. The *Herald* has the largest daily sale; and the *Ledger* stands at the head of the weekly issues. The law requires a tax to be paid upon gross receipts in excess of $5,000 per annum. The *Herald's* table is compiled from the official tax list, and is no doubt correct. The SCIENTIFIC AMERICAN appears to be the only journal published in the city devoted to mechanical and engineering science whose receipts from the sale of papers exceed the sum exempt by law from taxation. The excess upon which we were required to pay taxes during the past year, amounted to $77,241.

There are but six papers reported in the table referred to whose circulation equals that of the SCIENTIFIC AMERICAN. It is, no doubt, by far the best advertising medium in its specialty to be found in the country.

Explosion at a Wood Preserving Establishment.

An explosion of one of the tanks used by Robbins' Wood Preserving Company, for saturating wood with carbolic acid, took place at their works in Third street, Brooklyn, on the evening of the 26th October, killing Mr. Martin Voorhees, the inventor of the peculiar form of tank used, also killing a laborer employed in the establishment, and injuring several others. A member of the firm has since publicly explained that the explosion was in reality a steam explosion; the new tank being an experimental one in which the wood was placed in the same tank with the dead oil from which the acid was distilled, and the steam being generated under high pressure from the sap contained in the green wood falling upon the hot oil at the bottom.

Per contra, a correspondent of the *Herald*, writing in regard to this explanation of Mr. Robbins, asks how it happens that the remains of the two unfortunate men who were killed were blackened and charred, and their clothing nearly burned off, if "superheated steam" caused the explosion. And again, whether this explosion, as well as the one in Jersey City last spring and the other in San Francisco last summer, which resulted from the attempts to put this same process into practical operation, are not attributable to some fatal error in the process itself, which renders it altogether impracticable. He also states that the explosion in San Francisco caused the loss of seven lives and more than $50,000 worth of property.

Editorial Summary.

TELEGRAPH APPARATUS.—Mr. Chas. Durant, of New York city, is the inventor of several improvements of a practical nature, intended to lighten and facilitate the labors of telegraph operators. The present improvement relates to the relay machines, and its object is to do away with the trouble commonly experienced in regulating the adjustments of the instrument. In this patent Mr. Durant, among other things, claims "So combining a relay machine and one or more batteries, or other electrical supply, with a telegraph instrument, that when, by the operation of the instrument, the main telegraph circuit is opened or closed, another circuit, communicating with the same relay machine will be correspondingly opened and closed, and the attractive power developed in the relay magnet will be thereby modified.

EFFECTS OF DISCHARGES OF ARTILLERY UPON CLIMATE.—A correspondent from Missouri suggests that continued discharges of artillery induce rain storms. He cites the observations of several gentlemen who stated that during the wars of Napoleon heavy battles were uniformly followed by heavy rain storms. He suggests also that perhaps the change in climate of the Plains (referred to on page 214, current volume) along the line of the Pacific Railroad, may be effected by the concussive effect, similar to that produced by the discharge of cannon, caused by the passage of trains over the hitherto undisturbed plains. All we can say on this matter is, that until a direct connection between atmospheric concussion and the fall of rain has been established, we must regard it as merely a conjecture.

METHOD FOR CROSSING STREETS.—Messrs. Adam and Nicolas Barth, of New York city, have submitted to us a plan for street crossing, which is perhaps worth consideration. It employs the principle of the elevator, with horizontal elevated rails to convey the platform from side to side. Passengers step upon the platform, are raised to the proper hight, conveyed across, and let down upon the opposite side of the street. Mechanically this is perfectly practicable, and it might prove more acceptable than bridges. The plan is certainly free from some of the objections raised against bridges, though it might be found on trial to have some defects which the bridges do not have.

OLEOGRAPHY.—This is the name given to the new art of fixing on paper the special forms which a drop of oil assumes when poured on water. These forms, or patterns, vary with every sort of oil, and are exceedingly interesting and beautiful. Oleography may be briefly described thus: Having obtained the oil pattern, lay on it for an instant a piece of glazed surface paper, then take it off and place it on a surface of ink or any other colored fluid in water or spirit. Now wash off any excess of color with plain water; when dry, the pattern is fixed. The paper becomes greasy where the oil is present and thus resists the action of the ink, but it is rapidly absorbed on the blank places.—*Septimus Piesse.*

STEAM JETS IN BURNING BRICKS.—The essential feature of this invention consists in so constructing a brick kiln that the products of combustion from fires contained in furnaces at one end of the kiln are caused to forcibly permeate the mass of bricks by the action of jets of steam or other equivalent exhausting device situate at the opposite end of the kiln and *vice versa*, the products of combustion being caused to pass through the mass from one end to the other of the kiln first in one direction and then in the opposite direction, thereby heating the bricks uniformly throughout; jets of steam are also directed into the combustion chambers and over the fuel of those fire-places which are in action for the time being, as well as into their corresponding ash-pits.

AERIAL NAVIGATION.—We would call the attention of our readers to an article on "Aerial Navigation," which appears in this number and which is the first of a series of articles to appear on this subject. Many practical and scientific men believe we are on the eve of new discoveries which will render the navigation of the air practicable, notwithstanding the failures which ave hitherto attended experiments in this field. In this state of expectancy, the history of some of the most prominent events in the science of aerostation, especially those which have occurred in our own country, can not fail to be of interest.

A COMPANY has been formed in Lynchburg, Va., for the purpose of establishing works for extracting compounds from oak bark. They expect to begin operations very soon.

MANUFACTURING, MINING, AND RAILROAD ITEMS.

The castor bean is becoming an important industry in Perry county, California. One prominent dealer received at his warehouse 1,000 bushels in one day, paying $3·18 per bushel. It yields more bushels to the acre than wheat.

Tanned cotton, or "cotton leather" is prepared by treating cotton fabrics in a manner similar to that in which skins and hides are treated for the manufacture of leather. Cotton is thereby made stronger and better able o resist the effects of moisture.

There is only one steam fire engine in France. This is one of the American pattern, and is owned by the city of Havre. The other French towns, including the capital itself, depend for the extinguishment of fires upon hand-engines, about the size of a garden hose, and worked by soldiers, called *pompiers*.

M. Morin states in *Cosmos* of October 2, that he has in his possession wooden water wheels which have been in use more than 1,500 years for the evacuation of water from a copper mine. These wheels are more than 18 eet in diameter. The wood was found on analysis to be perfectly sound, and to be partly converted into a compound of cellulose and copper.

The following statistics of coffee production are given by Professor J. Darby. Of the 713,000,000 lbs. produced by the world, per annum, Brazil furnishes 400,000,000, or more than half of the whole. Java 140,000,000, Ceylon 40,000,000, St. Domingo 40,000,000, Cuba and Porto Rico 25,000,000, Venezuela 25,000,000, Sumatra 25,000,000, all others, including the Mocha, 18,000,000

A ship called the *Ariadne*, of 1,400 tuns register, and 200-horse power, is to sail from London on the 16th of November for Buenos Ayres, for the purpose of bringing live cattle from South America to England. The vessel was built expressly for the end contemplated. Her return is expected about February next, and if the voyage will prove a success, other ships are to be built on the same principle, and a regular trade in live cattle will be established.

Attention is called by the Argentine Government to the National Exhibition to be held at Cordova about the 17th of April, 1870. Foreign machines and products of art, industry, and science are to be admitted on an equal footing with those of native origin. Details regarding the conditions of exhibition, the provisions for transportation, etc., may be had, on application, from the Minister Plenipotentiary or any of the consuls of the Argentine Republic in this country.

Mr. Lange, the London representative of the Suez Canal Company has made some experiments on the canal with a corvette carrying ten Armstrong guns and driven by engines of 300-horse power. He has ascertained the following important points: First, the speed necessary to be maintained on a vessel of the dimensions of the ship experimented with, in order to enable a straight course to be steered, is from 3·2 to 3·7 knots an hour. Second, the embankments suffered no injury while the vessel was going at a rate of 5·4 or 6·4 knots an hour. Third, it was found that the loss of speed incurred by the vessel navigating the canal when compared with the rate on the open sea in smooth water, amounted to one fourth, the same power being employed in both cases.

While some of the workmen employed in a pit situated at the east end of Clark street, Airdrie, Scotland, were working in a seam of gas coal, called the Tongue seam, they turned out a frog which had been embedded in the coal. They had just fired a shot, and out of the debris issued a pretty golden-colored frog, dead, to be sure; but the body was warm and fresh, as though life had been newly extinct. The seam was 60 fms. deep, and had been previously worked as an ironstone pit at a less depth. There was, however, 50 fms. of rock penetrated before either of these seams were reached. The frog was about 6 in. long by 4 in. broad. The miners cut up the body, and discovered gas coal in a paste state in the stomach. Supposing the frog firmly embedded in the coal, how would the poor batrachian's jaws find room to perform the duties of mastication, even supposing it had got successfully located inside an uctuous seam of gas coal? Or are we to suppose that it imbibed the coal paste through the pores of the skin?

Recent American and Foreign Patents.

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

CULTIVATOR.—J. H. Lockie, Humphrey, N. Y.—This invention has for its object to furnish an improved cultivator which shall be so constructed and arranged that it may be readily adjusted to cultivate rows of plants at different distances apart, and which shall at the same time be strong, durable, and not liable to get out of order, or be broken by striking a stone or other obstruction.

PRINTERS' GALLEY.—William Quail, New York city.—This invention has for its object to improve the construction of printers' galleys so as to make them more convenient.

PORTABLE FENCE.—Jacob Closs, Decatur, Ind.—This invention relates to new and useful improvements in fences for farm and other purposes, and consists in supporting the fence clear of the ground by means of braces and double iron clevises.

PROPELLING WHEELS.—Thomas Bell, Bellport, N. Y.—This invention relates to a new and useful improvement in wheels for propelling vessels in the water, whereby they are rendered more effective than when made in the ordinary manner.

PROCESS FOR TREATMENT OF CANCER.—Lawrence Roy, Plattsburg, Mo. —This invention and discovery relate to an improvement in the treatment of cancer diseases

SPIRIT LEVEL.—A. P. Odholm, Bridgeport, Conn—This invention relates to a new and improved plumb and level of that class in which the alcohol is confined within a circular chamber.

MACHINE FOR BLEACHING CANE JUICE.—Evan Skelly, Plaquemine, La.—This invention comprises an improved arrangement of automatic feeding and air supplying apparatus for the furnace; also, an improved arrangement of cooling devices through which the gas is passed and cooled in the presence of water; also, an arrangement of means for agitating the juice, exhausting the air, and providing the gas thereto, in a manner to produce the most intimate contact of the gas with the particles of juice for bleaching.

CLOTHES BARS.—L. J. Adams, Hoosick Falls, N. Y.—This invention relates to improvements in the construction of that class of clothes bars made in frames or panels and hinged together so as to swing open on the hinge joints horizontally when standing on one end. The invention consists in a peculiar way of hanging the said frames or panels to a common center, so that when extended they will radiate from a common center, nstead of assuming a zigzag or serpentine line.

CAR COUPLING SHACKLE.—J. Marston, Saratoga Springs, N. Y.—This invention relates to improvements in shackles for connecting cars together in trains, and consists of an improved arrangement of double jointed bars specially adapted for connecting cars of different hights.

GATE LATCH.—F. M. Ranons, Little Shasta Valley, Cal.—This invention consists in a sliding latch having a hooked end and a spiral spring arranged to constantly draw the latch into the case which is fixed on the gate; also, of a double beveled catch which draws the latch lengthwise and at the same time raises it when the gate shuts, and behind which the hooked end of the latch is drawn back into a notch by the spring, the said notch holding the gate closed and preventing the latch from being lifted up by animals.

SOFA ATTACHMENTS.—H. C. Grube, Plaquemine, La.—This invention relates to improvements in sofas and lounges, having for its object to provide a convenient arrangement of table, wash stand, bureau, and drawer attachments calculated to combine in a sofa or lounge the necessary outfit of such articles for a room, in a portable form, and so arranged as not to give an objectionable appearance to the articles.

POTATO DIGGER.—J. J. Singley, Lafayette, Ind.—This invention consists in the application to a scraping plow, and endless screening device arranged in connection therewith on a frame borne upon two wheels, of certain vine cutting devices, to prevent, as much as possible, the gathering of the vines on the screen and clogging the same; also, an earth discharging apparatus and screen shaking and brushing apparatus.

STALK CUTTER.—R. A. Boulware, Doniphan, Kansas.—The present invention relates to a new and useful device for cutting up the stalks of corn, etc., in the field, preparatory to plowing the same, the machine for this purpose having a crushing or braking roller in front, which is immediately followed by a series of knives set in a revolving frame behind, which chops up the corn stalks and leaves them lying on the surface.

GUN LOCK.—J. M. Hill and R. D. Hay, Crooked Creek, N. C.—This invention consists in the application to the barrel around the nipple of a raised projection over which the hinged cap will close snugly when closed over the nipple, so as to wholly inclose the said nipple for better protection.

ENEMA NAVAL AND UTERINE SYRINGE.—J. J. Essex, Newport, R. I.—The object of this invention is to obviate the difficulty attending the use of the the ordinary syringes, which are worked by means of an elastic bulb, not being devised in such a manner that they can be placed in proper position so as to admit of a person applying or using it with facility and comfort. To obviate this difficulty the elastic bulb is connected with the valve box by means of an elastic tube, which permits the application and operation of the syringe to inflamed or diseased parts without pain or difficulty to the person using it.

MACHINE FOR CUTTING CORKS.—Olney Arnold, Pawtucket, R. I.—The object of this invention is to provide for public use, a machine which will grasp the bark, hold it firmly, and apply the cutting knives to it in such a manner as to cut out the corks rapidly, with great perfection, and with the utmost economy of material, each movement of the operator's lever producing a large number of finely cut corks.

FRUIT-PRESERVING APPARATUS.—C. C. Williams, Brooklyn, N. Y.—This invention has for its object to furnish an improved apparatus for preserving fruits, meats, vegetables, etc., by heating the said substances to the proper degree by the introduction of steam into the lower or bottom parts of the cans in which said substances are to be sealed up.

BOB SLEIGH COUPLING.—William E. Van Schaick, Delavan, Wis.—This invention has for its object to furnish an improved coupling for connecting the front and rear bobs of a bob sleigh to each other, which shall be simple in construction and effective in operation, enabling the movement of the rear bob to be fully controlled or guided by the movement of the forward one.

CAR COUPLING.—Matthew Quinn, Wataga, Ill.—This invention has for its object furnish an improved self-coupling car coupling, designed more especially for freight cars, but equally applicable to other cars, and which shall be so constructed and arranged as to conveniently couple cars differing in hight.

WEATHER STRIP FOR WINDOW SASHES.—Andrew Jackson Devoe, Hackensack, N. J.—This invention relates to a new weather strip for window sashes, by means of which air and water are effectually prevented from being blown through the crevices, between the sashes, and under the lower sash.

PITCHING BARRELS.—J. P. Benoit, Detroit, Mich.—This invention relates to a new and useful machine for pitching barrels for holding beer and other liquids, and consists of a furnace mounted on wheels with a suitable air chamber and pipes attached, connected with a blower, by means of which a current of heated air is forced into the barrel of sufficiently high temperature to open the pores of the wood, and render the pitch so liquid that it readily flows into the pores and is incorporated with the wood, while it is, by properly agitating the barrel, made to cover the entire inner surface and render the barrel perfectly tight.

HEAT RADIATOR.—A. Albee, Worcester, Mass.—This invention relates to radiators for retaining and utilizing the heat of a stove, and in combining therewith an adjustable shelf.

GRATE BAR.—Monroe Morse and Charles H. Morse, Franklin, Mass.—This invention relates to a new and useful improvement in grate bars for furnaces, and consists in a false bar, or rider, made in one or more sections, which false bar, or rider, is most exposed to the heat, and which may readily be removed or renewed.

WASH BOILER.—Daniel Lucas and James Lucas, Green Bay, Wis.—This invention relates to a new and useful improvement in boilers for washing clothes.

EXPLOSIVE COMPOUND.—William Mills, New York city.—This invention relates to a new and important improvement in the composition of compounds of an explosive character, designed as a substitute for gunpowder and for other explosive compounds.

SHOE LAST.—Wm. C. Shipherd, Willoughby, Ohio.—This invention consists of a graduated adjustable, circular, notched, catch plate attached to the last, and a spring catch on the instep block of peculiar construction, arranged for operation in conjunction with the said catch plate.

COTTON SEED HULLER.—Frank A. Wells, Memphis, Tenn.—The object of this invention is to provide a cotton seed huller more efficient in operation, less liable to clog or be damaged by foul or hard substances, and better adapted for adjustment of the cutters of the concave shell than the machines now in use. It is also intended to provide a more economical arrangement of the cutters in respect of grinding them.

WATER WHEEL.—B. W. Tuttle, Galena, Ill.—This invention relates to improvements in the "Barker mill," and other similar wheels, designed to improve the efficiency of the same, and consists in the application thereto of an improved method of supplying the water; also, an improved arrangement of hollow shaft for transmitting the motion and for employment as an air chamber buoying the wheel; also, in the arrangement of an air chamber at the bottom of the wheel for buoying it, operating as a float to support a portion of the weight of the wheel upon the tail water; also, an arrangement of adjustable buckets and mechanism supported upon the shaft, whereby the buckets may be adjusted while the wheel is in motion, and also several other arrangements of details.

HOP SODA.—Arnold F. Dückwitz, New York city.—Hops have long been esteemed for their valuable medicinal qualities, and Mr. Dückwitz gives them to the public in the shape of a healthful and palatable beverage, which promises to be quite an acquisition to the general stock of curatives. Hop soda is a combination of extract of hops and soda water.

TREADLE MOTION.—E. A. Goodes, Philadelphia, Pa.—This invention consists of a disk or other equivalent device connected to the lower end of a vibrating pendulum so as to vibrate thereon, and to which, at the top, the crank-connecting rod is jointed, and all arranged in such a way that the lower face of the disk being prevented from swinging, an oscillating motion imparted to the axis will swing the top back and forth, so as to impart rotary motion to the crank.

PUMP.—Thomas Metzler, Wooster, Ohio.—This invention consists in an arrangement of means for operating a collapsing bulb pump when suspended in or near the water of a well or cistern to protect it from frost.

GOPHER TRAP.—D. N. Smith, San Bernardino, Cal.—This invention relates to a new gopher trap, which is of very simple construction, and which will be sure to catch the animals if they pass through it.

BOOTS AND SHOES.—Edmund Brown, Burlington, Vt.—This invention relates to a new device for lining the edges of lace shoes and boots, and has for its object to facilitate the fastening of the two flaps or folds, so that the tedious lacing or buttoning heretofore required can be dispensed with.

ATTACHMENT TO ROVING MACHINERY FOR DISCHARGING ELECTRICITY.—Aaron Goodspeed, Granville, N. Y.—The object of this invention is to discharge the electricity which is produced by the reciprocating motion of the rollers of wool and cotton roving machinery.

BALLOT.—Austin B. Culver, Westfield, N. Y.—The object of this invention is to protect and secure the purity of the elective franchise by preventing fraudulent voting, and the invention consists in providing a band around each ballot in such manner that each ballot is kept separate to prevent one voter from intentionally or accidentally putting in two or more votes, or rather to detect such double voting in case it should be performed. The device is cheap and simple, and can be put on or taken off from the ticket in a moment. It would take less time to put it on to a ticket than it would the inspector to find the name on the register, which must be done before depositing the same. It also makes the ballot more compact, consequently they can be deposited, and the opening in the ballot box kept clear, with less trouble.

LIGHTNING RODS.—W. S. Reyburn and F. J. Martin, Philadelphia, Pa.—This invention consists in combining a sheet-copper covering, constructed in a peculiar manner, with a sheet-zinc center, similarly contrived, whence certain advantages result.

MACHINE FOR DRIVING RAKE TEETH.—N. M. and A. T. Barnes, Tiffin, Ohio.—The object of this invention is to construct a simple and convenient machine for driving wooden teeth into the heads of horse hay rakes, that will perform the work more quickly, cheaply, and accurately, and with less danger of breaking or battering the teeth than can be done by hand.

SCREW DRIVER.—J. C. Pinner, Newbern, Tenn.—The object of this invention is to provide for public use a simple and convenient tool with which a screw can be more readily and easily inserted or removed than with the other screw drivers heretofore brought into use.

ADJUSTABLE CIRCULAR SAW-MITERING MACHINE.—J. P. Grosvenor, Lowell, Mass.—The object of this invention is to obtain, in mitering machines having a circular saw, a more simple, cheap, and perfectly-operating device for adjusting the saw while keeping the belt taut at all times, and the table level and of uniform hight. The machine is an improvement upon those patented by the same party May 5th, 1863, and September 15th, 1868, respectively, the difference between the present and the former inventions consisting in the peculiar device for enabling the saw mandrel, although hung in an inclined frame, to be oscillated in a vertical plane. The same construction also enables the operator to raise or depress either end of the mandrel, and by changing the saw to one end or the other its inclination can be adjusted at pleasure in either direction.

BREECH-LOADING FIRE-CRACKER HOLDER.—A. E. Peck, Brooklyn, N. Y. —This invention has for its object to furnish an improved holder for holding fire crackers, which being discharged in such a way that the fire cracker may be discharged or exploded with perfect safety, while projecting the shell of the fire cracker from the muzzle of the holder, and which shall, at the same time, be breech loading.

PARLOR AND SIDEWALK SKATE.—N. W. Hubbard, New York city.—This invention has for its object to furnish an improved parlor and sidewalk skate, which shall be so constructed and arranged as to run with little friction and to pass over obstructions, adapting it for use in the parlor, upon the sidewalk, or upon a street paved with the Nicolson pavement.

MATCH SAFE.—August Steinbök, New York city.—This invention relates to a new match safe, arranged to contain a self-igniting wick—that is, one which will ignite as soon as brought in contact with the atmosphere.

RAILROAD TRACK.—Baron Ludwig Lo Presti, Vienna, Austria.—The object of this invention is to construct a cheap railway, which can be easily constructed, and which is capable of extended application and of ready transfer and displacement. In accordance with this new system railways can be rapidly constructed at a comparative small cost and without any reference to the natural formation of the ground.

SAW SET.—H. Sloat, Watertown, N. Y.—This invention relates to a new implement for setting all kinds of saws; it can be applied without removing the saw from the mandrel, and will set the teeth very accurately and evenly.

COAL STOVE.—George W. Herrick, Stuyvesant, N. Y.—The object of this invention is to construct a heater for burning Western bituminous coal and other tar coal depositing much lamp black, and the invention consists chiefly in providing for ample draft so that all the products of combustion and the solid matter carried off with the same will be burned.

VELOCIPEDE.—Edward A. Lewis, St. Charles, Mo.—This invention has for its object to so construct the cranks of velocipedes that they are made longer where the greatest power is required without increasing the diameter of the circle to be described by the foot. The invention consists in the use of sliding cranks, which project from both sides of the shaft, one end of each crank being guided by a fixed eccentric groove or track in such manner that the crank pin is moved away from the shaft as long as the power is applied to the same by the foot; when the power is not required on the return stroke, the crank pin is drawn close to the shaft, and thus, without describing a large circle, the crank lever is made longer than usual, when required for actual use.

BUCKLE.—D. S. Butler, Otterville, Mo.—This invention relates to a new self-fastening buckle, which can readily connect two straps without sewing or other tedious process.

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; besides, 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.*

F. B.—The best water fence we have ever seen to be used in small streams was made as follows: A gate sliding in upright ways at the ends, like an old-style turnpike gate, has attached to the bottom board (a scantling is better as not so likely to be broken in high water) crutches which rest upon common empty barrels or casks. The uprights at the ends of the gate are provided with friction rollers, so that the gate slides up and down easily in the ways. Two or three casks will generally support the weight of the gate, so that it descends nearly to but does not enter the surface of the water. A gate thus constructed will rise and fall with the water, and if everything is properly made, is not liable to be washed away in high water. A good water gate for fencing purposes is in request.

C. S., of Va.—A simple test will enable you to distinguish between the pulverized carbonate of soda and the chlorate of potash, the crystals of which are so broken as to render them difficult for you to distinguish. Taste would be enough to a person familiar with these salts but premising that you are not sufficiently posted, you can detect the difference by adding to a little of each in the solid state a little sulphuric acid. With carbonate of soda there will at once ensue a great disengagement of colorless gas (carbonic acid) with much frothing. With chlorate of potash the action will be slow while the materials are cold, but when a gentle heat is applied the mixture becomes very yellow and a greenish irritating and suffocating gas (chlorine) is evolved.

C. B., of N. Y.—Time will remedy the disagreeable taste of the water in your newly cemented cistern. We know of nothing you can do but possess your soul in patience.

R. S. M., of Mass.—A cheap attractive device in the way of signs for shop windows is always salable, and there is no doubt that yours is patentable. You would do well to prosecute the case at once. Its amusing character would be sure "to draw."

T. L. B., of Vt.—Your method of preparing plumbago as a stove polish is old, except the form in which it is packed for use. You could probably secure a patent on that as its convenience is obvious.

R. C. D., of Minn.—The inventor of logarithms was John Napier, a Scotchman; born 1550, died 1617. He was a man of great inventive talents, and displayed them in mechanics as well as in mathematics.

R. S., of Ca.—The pressure per square inch in fresh water at a depth of ten thousand feet is 4,334 pounds nearly.

E. B. R., of N. Y.—Sand molds for brass castings are faced with either meal dust, flour, powdered chalk, finely-sifted wood ashes, pulverized charcoal, rotten stone, and sometimes with the soot of cork-shavings, or other carbonaceous material. Among these various substances you will undoubtedly find the one which you suppose is the secret of the founders you refer to.

R. L. J., of Ohio.—There is no rule by which the proportions of any one part of a marine engine can be computed independently of the other parts. Details vary greatly in different engines, according to particular circumstances. Your question, therefore, as to the proper hight of gallows frame above cylinder, is, in the absence of all other data, unanswerable.

T. D., of La.—The project of the Nicaraguan canal dates back to 1551, at which time the historian Gomara indicated four routes for such a canal. These routes have ever since been considered as the most favorable ones. A survey of one of these routes was made under the orders of the Spanish Government in 1781.

W. W., of N. Y.—The various kinds of self-raising flour in market are, we believe, all patented. If you wish, you can obtain the specifications of these patents from the Patent Office on payment of a small fee.

C. L., of Ky.—An instrument for measuring distances passed over in traveling upon roads by carriages, velocipedes, etc., may be properly called an odometer or perambulator. Your device is probably patentable.

Z. W., of Ind.—While we are aware that practical men are often led to use various solutions for tempering steel, their practice varies so much that many will be found to condemn what others praise in the highest terms. Scientific men have failed to detect any better results from solutions than from simple water. There is an amount of traditionary practice transmitted from father to son, and each workman generally favors that to which he has been bred. We do not believe in solutions, and therefore do not recommend any of the numerous salts which have been employed for this purpose.

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For Sale—Murphy's patent governor for steam and other engines. It is one of the best ever invented—is efficient, durable, and economical. The Right for sale, or would arrange with parties to manufacture M. Murphy, Charlotte, N. C.

For Sale—A patent for a composition for covering steam boilers, pipes, etc. E. D. & W. A. French, 3d and Vine sts., Camden, N. J.

For tinmans' tools, presses, etc., apply to Mays & Bliss, Brooklyn, N. Y.

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

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

For the best double-acting Turbine Wheel in the world, described in the Scientific American, Jan. 18, 1868, address Harvey Brown, Urbana, O.

For Sale—60-H. P. Engine and two large Tubular Boilers, first rate order. Will be sold cheap. N. D. Preston, Fulton, Oswego Co., N. Y.

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

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

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

Engineers and all others desiring a reliable timekeeper should write to Howard & Co., 619 Broadway, New York, for the Descriptive Price List of Waltham Watches.

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

Manganese Ores suitable for glass, steel, oil boilers, at low prices. Muriatic Acid, full strength, price 1½ cents per lb. Soda Ash, Bleaching Powder, fresh made, full test, at market prices. Michigan Chemical Company, Jackson, Mich.

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

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

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

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

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

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

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

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

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FOR THE WEEK ENDING OCT. 26, 1869.

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96,071.—HEAT RADIATOR.—A. Albee, Worcester, Mass.
96,072.—STILT.—M. C. Ames (assignor to himself and W. E. Simonds), Hartford, Conn.
96,073.—MACHINE FOR CARBURETING ATMOSPHERIC AIR.—Arthur Barbarin, New Orleans, La.
96,074.—APPARATUS FOR CARBURETING AIR.—Arthur Barbarin, New Orleans, La., and A. E. Dupas, Paris, France.
96,075.—PROPELLER.—Thos. Bell, Bellport, N. Y.
96,076.—PITCHING BARREL.—J. P. Benoit, Detroit, Mich.
96,077.—COMBINED SAWSET, CLAMP, AND VISE.—B. Blackstone, Warren, Ill.
96,078.—MACHINE FOR SHARPENING SAWS.—L. N. Borem, Kennard, Ohio.
96,079.—STALK CUTTER.—R. A. Boulware, Doniphan, Kansas.
96,080.—SAMPLES FOR SHOE DEALERS.—A. N. Breneman, Lancaster, Pa.
96,081.—APPARATUS FOR EVAPORATING CANE JUICE.—M. S. Bringier, Ascension parish, La.
96,082.—LANTERN.—T. B. Burgert, Crestline, Ohio.
96,083.—BUCKLE.—D. S. Butler, Otterville, Mo.
96,084.—PORTABLE FENCE.—Jacob Closs, Decatur, Ind.
96,085.—PALLET AND BRUSH FOR GRAINING.—Fred'k Cole, Kankakee, Ill.
96,086.—TICKET CLIP.—Austin B. Culver, Westfield, N. Y.
96,087.—SURGE RELIEVER.—C. D. Cutting (assignor to himself and W. J. Keefe), Boston, Mass.
96,088.—SUGAR-CANE MILL.—Anthony Demarce, Fairfield, Iowa.
96,089.—AERATED MEDICAL BEVERAGE.—A. F. Duckwitz, New York city.
96,090.—TELEGRAPH APPARATUS.—Charles Durant, Jersey City, N. J.
96,091.—MACHINE FOR MAKING ROPE MOLDINGS.—Charlton Eden, Indianapolis, Ind.
96,092.—METHOD OF HANGING BELLS.—Gilbert Eguillon, Paris, France. Antedated Oct. 16, 1869.
96,093.—EGG DETECTER.—F. J. Eisenman, Chicago, Ill.
96,094.—BURGLAR ALARM.—Wm. H. Emmons, New York city, and Franklin Kissam, Newark, N. J.
96,095.—UTERINE SYRINGE.—J. J. Essex, Newport, R. I.
96,096.—FOLDING SCHOOL DESK.—Samuel F. Estell, Richmond, Ind.
96,097.—PROCESS OF OBTAINING USEFUL OIL FROM THE ACID RESIDIUM OF PETROLEUM.—A. Farrar, Longwood, Mass.
96,098.—RAILWAY CAR BRAKE.—Eugene De B. Freer, Lima Center, Mich.
96,099.—PUMP.—A. D. Gates, Surrey, Wis.
96,100.—FOLDING DESK AND SEAT.—H. E. Gillet, Oswego, N. Y.
96,101.—REFRIGERATOR AND WATER AND WINE COOLER.—L. M. Goldsborough, Washington, D. C.
96,102.—APPARATUS FOR REMOVING ELECTRICITY FROM WOOL IN ROVING MACHINES.—Aaron Goodspeed, Granville, N. Y.
96,103.—SOFA ATTACHMENT.—H. C. Grube, Plaquemine, La.
96,104.—COMBINED HORSESHOE AND BOOT.—H. G. Haedrich, Philadelphia, Pa.
96,105.—FLUID METER.—Wm. Hamilton, Toronto, Canada, assignor to himself and H. Kimball, Randolph, Vt.
96,106.—GATE.—Reuben Hatch, Jr., Traverse City, Mich.
96,107.—CLOTHES RACK.—James Hatfield, Sparta, Wis.
96,108.—PAPER BOX.—G. M. Hendrickson, Albany, N. Y.
96,109.—LIME KILN.—Geo. Hensler, Kankakee, Ill.
96,110.—BASE-BURNING STOVE.—George W. Herrick, Stuyvesant, N. Y.
96,111.—STAIR ROD.—Selah Hiler, New York city.
96,112.—NIPPLE GUARD FOR FIRE-ARMS.—R. D. Hay and J. M. Hill, Crooked Creek, N. C.
96,113.—IMPLEMENT FOR LAYING WOOD PAVEMENT.—Philip Hinkle, San Francisco, Cal.
96,114.—RAILROAD CAR VENTILATOR.—Robert Hitchcock, Springfield, Mass.
96,115.—FILTERING SECTIONS FOR TUBE WELLS.—Edmund Holden, Hartford, Mich.
96,116.—BUNG.—V. A. Houdaille, Paris, France.
96,117.—PARLOR SKATE.—N. W. Hubbard, New York city.
96,118.—MUFF AND COLLAR BOX.—J. P. Jones (assignor to Jason Crane), Bloomfield, N. J.
96,119.—EGG CARRIER.—P. P. Josef (assignor to himself and Wallace Johnson), Buffalo, N. Y.
96,120.—HEEL-CUTTING MACHINE.—Samuel Keen, East Bridgewater, Mass.
96,121.—SIGN FOR STREET LAMPS.—J. W. Larimore (assignor to himself and Alonzo Marks), Chicago, Ill. Antedated October 12, 1869.
96,122.—HANDLE FOR PANS AND OTHER COOKING UTENSILS.—J. A. Lawson, Troy, N. Y. Antedated Oct. 9, 1869.
96,123.—WASHING MACHINE.—Fabius H. Lawton (assignor to himself, David W. Prosser, and Joshua Cheney), Fluvanna, N. Y.
96,124.—VELOCIPEDE.—E. A. Lewis, St. Charles, Mo.
96,125.—MACHINE FOR MAKING TAGS.—Wm. Liddell (assignor to himself and B. S. Binney), Boston, Mass.
96,126.—CULTIVATOR.—J. H. Lockie, Humphrey, N. Y. Antedated Oct. 16, 1869.
96,127.—RAILWAY TRACK.—B. L. Lo Presti, Vienna, Austria. Patented in England Oct. 22, 1868.
96,128.—VELOCIPEDE.—Geo. Lowden, Brooklyn, N. Y.
96,129.—WASH BOILER.—Daniel Lucas and Jas. Lucas, Green Bay, Wis.
96,130.—RAILWAY CAR COUPLING.—John Marston, Saratoga Springs, N. Y.
96,131.—MOLDING AND CASTING PIPE.—Louis Martaresche, Pittsburgh, Pa.
96,132.—MODE OF PRODUCING USEFUL ARTICLES FROM COLLODION AND ITS COMPOUNDS.—J. A. McClelland, Louisville, Ky.
96,133.—TOOL FOR EXPANDING BOILER TUBES.—Robert McKenzie, New Orleans, La.
96,134.—COMBINED KNIFE AND FORK.—James McMorries, Columbus, Miss.
96,135.—COAL STOVE.—John McNeight, Wakefield, Mass.
96,136.—PUMP.—Thomas Metzler, Wooster, Ohio.
96,137.—PEDALS FOR PIANOS, ETC.—A. A. Mixer, Hamilton, Ohio.
96,138.—GRATE BAR FOR STEAM AND OTHER ENGINERY.—Monroe Morse and C. H. Morse, Franklin, Mass.
96,139.—FOLDING CHAIR.—J. Nicolai and J. Ph. Rinn, Boston, Mass.
96,140.—SPIRIT LEVEL.—A. P. Odholm, Bridgeport, Conn. Antedated Oct. 16, 1869.
96,141.—SACCHARINE EVAPORATOR.—R. Orford, Dowagiac, Mich. Antedated Oct. 12, 1869.
96,142.—CENTRIFUGAL MACHINE FOR EXTRACTING HONEY FROM THE COMB.—H. O. Peabody, Boston, Mass.
96,143.—FIRE-CRACKER HOLDER.—A. E. Peck, Brooklyn, N. Y.
96,144.—FLOWER POT.—B. W. Putnam, Boston, Mass.
96,145.—PRINTERS' GALLEY.—William Quail, New York city.
96,146.—RAILWAY CAR COUPLING.—Matthew Quinn, Wataga Ill.
96,147.—GATE LATCH.—F. M. Ranons, Little Shasta Valley Cal.
96,148.—COMPOUND FOR MAKING WATER-PROOF PAPER.—C. S. Rauh, Boston, Mass.
96,149.—SHUTTER WORKER.—E. W. Scott, Wauregan, Conn Antedated Oct. 16, 1869.
96,150.—KEY FACE FOR CONCERTINA.—L. A. Seward, New Orleans, La.
96,151.—APPARATUS FOR TEACHING MUSIC, ETC.—Louis A Seward, New Orleans, La.
96,152.—SHOE LAST.—W. C. Shipherd, Willoughby, Ohio.
96,153.—POTATO DIGGER.—J. J. Singley, Lafayette, Ind.
96,154.—WASHING MACHINE.—R. H. Sipes, Bloody Run, Pa.
96,155.—MACHINE FOR BLEACHING CANE JUICE.—E. Skelly Plaquemine, La.
96,156.—SAW SET.—H. Sloat, Watertown, N. Y.
96,157.—CONDENSER FOR ALCOHOL STILLS.—Ed. Smeeth Chicago, Ill.
96,158.—FAUCET.—A. D. Smith, Grafton, Ohio.
96,159.—GOPHER TRAP.—D. N. Smith, San Bernardino, Cal.
96,160.—SEWING MACHINE.—E. H. Smith, Bergen, N. J. Antedated Oct. 13, 1869.
96,161.—APPARATUS FOR UNLOADING HAY.—George Smith, Providence, R. I. assignor to himself and J. C. De Lang, Detroit Mich.
96,162.—HAND STAMP.—R. H. Smith, Springfield, Mass.
96,163.—MATCH SAFE.—August Steinbok, New York city.
96,164.—HALTER CLASP.—E. H. Stewart, Philadelphia, Pa.
96,165.—BLACKING BRUSH.—Augusta N. Thompson, Holyoke, Mass.
96,166.—THIMBLE.—T. R. Timby, Saratoga, N. Y.
96,167.—CORN CULTIVATOR.—D. W. Travis, Enfield, N. Y. Antedated Oct. 12, 1869.
96,168.—WATER WHEEL.—B. W. Tuttle, Galena, Ill.
96,169.—SLEIGH COUPLING.—Wm. E. Van Schaick, Delevan, Wis.
96,170.—HARVESTER.—J. P. Van Sickle, Geneva, N. Y.
96,171.—BLIND HINGE.—Adolph Velguth, Milwaukee, Wis.
96,172.—CAR STARTER.—M. N. Ward, Bangor, Me.
96,173.—HORSE HAY FORK.—C. E. Warner, Syracuse, N. Y Antedated Oct. 16, 1869.
96,174.—CHIN REST FOR VIOLIN.—A. W. White, Boston, and J. J. Watson, Gloucester, Mass.
96,175.—COMBINED LATCH AND LOCK.—T. Weaver (assignor to J. W. Moffitt), Harrisburgh, Pa.
96,176.—WEATHER STRIP.—J. R. Webber, Chicago, Ill.
96,177.—COTTON SEED HULLING MACHINE.—F. A. Wells Memphis, Tenn.
96,178.—MEANS OF ATTACHING TOPS TO JUGS, CRUETS, ETC —Homer Wright (assignor to himself, H. H. Collins, and B. F. Collins) Pittsburgh, Pa. Antedated Oct. 9, 1869.
96,179.—APPARATUS FOR PRESERVING FRUIT.—C. C. Williams, Brooklyn, N. Y.
96,180.—ATTACHMENT FOR SEWING MACHINES.—Enoch S. Yentzer, Ottawa, Ill.
96,181.—CLOTHES DRYER.—L. J. Adams (assignor to himself, Wm. Hyland, and A. B. Miller), Hoosick Falls, N. Y.
96,182.—WATER WHEEL.—J. S. Anderson, Oconomowoc, Wis.
96,183.—CLOTHES-LINE SUPPORTER.—John Andrews, New Bedford, Mass.
96,184.—MACHINE FOR CUTTING CORK.—Olney Arnold, Pawtucket, R. I.
96,185.—MACHINE FOR DRIVING RAKE TEETH.—N. M. Barnes and A. T. Barnes (assignors to themselves and Tiffin Agricultural Works), Tiffin, Ohio.
96,186.—CENTRIFUGAL SUGAR-DRAINING MACHINE.—H. W. Bartol, Philadelphia, Pa.
96,187.—METHOD OF TRANSPORTING LETTERS AND PARCELS.—A. E. Beach, Stratford, Conn.
96,188.—SHOW COUNTER.—Aaron Beardsley, Mount Zion, Iowa.
96,189.—VISE.—J. D. Beck, Liberty, Pa.
96,190.—STEAM GENERATOR.—C. G. Beitel, Easton Pa.
96,191.—HARROW.—R. N. Bennett, Union Mills, Ind.
96,192.—HORSE POWER.—W. N. Berkeley, Cedar Rapids, Iowa.
96,193.—RAILWAY CATTLE GATE.—Joel Bowman and J. B. Overmyer, Reading, Ohio.
96,194.—LIGHTNING ROD POINT.—J. F. Boynton, Syracuse, N. Y.
96,195.—BOOT AND SHOE.—Edmund Brown (assignor to himself and Artemus Prouty), Burlington, Vt.
96,196.—CABINET BEDSTEAD.—S. S. Burr, Dedham, Mass.
96,197.—MODE OF CLEANING GAS RETORTS.—C. A. Bush, New London, assignor, for one quarter of his right, to H. P. Ostrum, New Haven, Conn.
96,198.—INSULATOR FOR TELEGRAPH WIRES.—C. A Bush, New London, assignor for two thirds of his right, to H. P. Ostrum and T. C. Bush, New Haven, Conn.
96,199.—GALVANIC BATTERY.—J. A. Calland, Nantes, France. Patented in France May 19, 1858.
96,200.—LAMP BURNER.—G. H. Chinnock (assignor to New Lamp Chimney Company), New York city.
96,201.—DISTILLING AND TREATING ALCOHOLIC SPIRITS.—George Clark, Buffalo, N. Y.
96,202.—MACHINE FOR CLEANING COTTON.—L. T. Clement, Smyrna, Tenn.
96,203.—WRENCH.—Loring Coes, Worcester, Mass.
96,204.—PIANO-FORTE ACTION.—B. E. Colley, Boston, Mass.
96,205.—SNOW PLOW.—M. A. Cravath and I. M. Cravath, Bloomington, Ill. Antedated Oct. 16, 1869.
96,206.—ROTARY PUDDLING FURNACE.—Samuel Danks, Cincinnati, Ohio.
96,207.—LATHE CHUCK.—H. M. Darling, Bridgeport, Conn.
96,208.—VELOCIPEDE.—C. E. Dayton, Meriden, Conn.
96,209.—EXTENSION TABLE.—Jacob Dourson (assignor to himself and F. A. Comstock), Columbus, Ohio.
96,210.—SHAFT AND COUPLING SHIELD.—M. L. Drake, Rockford, Ill.
96,211.—ROCKING CHAIR.—J. E. Emerson, Trenton, N. J.
96,212.—TAN BARK LEACH.—L. C. England, Philadelphia, Pa.
96,213.—WAGON SEAT.—W. R. English and Jason McClure English Centre, Pa.
96,214.—TWEER.—Samuel Epley, McGrawsville, Ind.
96,215.—MEDICAL COMPOUND FOR THE CURE OF FEVER AND AGUE.—J. M. Ferguson, Summit, Miss.
96,216.—SPRING PERCH FOR CARRIAGES.—E. R. Ferry (assignor to himself and P. Ferry, New Haven, Conn.
96,217.—MODE OF PLATING, COATING, AND ORNAMENTING ARTICLES OF IRON AND STEEL.—Kasson Frazer, Syracuse, N. Y.
96,218.—LOCK-NUT.—P. L. Gibbs, Dunleith, Ill.
96,219.—SCRUBBING BRUSH.—Samuel Gibson, Safe Harbor, Pa.
96,220.—MACHINE FOR SPLITTING WHALEBONE.—Nathan Goddard (assignor to himself and D. B. Saunders), Boston, Mass.
96,221.—TREADLE MOTION.—E. A. Goodes (assignor to F. M. Wood, H. F. Hays, Samuel Allen, J. S. Brown, T. E. Weidershiem, and T. S. Keyser), Philadelphia, Pa.
96,222.—HAT TIP.—S. H. Greenbaum, New York city.
96,223.—AIR BLAST ENGINE.—John Grim, St. Louis, Mo.
96,224.—METHOD OF ADJUSTING CIRCULAR SAWS.—J. P Grosvenor, Lowell, Mass.
96,225.—HORSE POWER CONNECTION.—J. A. Hafner, Commerce, Mo.
96,226.—EXTENSION SCAFFOLD.—P. L. Hains, Freeburg, Pa.
96,227.—DRILLING MACHINE.—John Hale, Scranton, Pa.
96,228.—GAS FLAT IRON.—Albert Hallowell and A. T. Atherton, Lowell, Mass.
96,229.—BAG FASTENER.—C. A. Haring, Peoria, Ill.

96,230.—Lock for Car Door.—A. V. Hartwell, Chicago, Ill.
96,231.—Manufacture of Putty.—G. W. Hatfield, Dayton, Ohio.
96,232.—Pruning Shears.—Virgil Hayes, Tekonsha, and Lewis Cuatt Eckford, Mich.
96,233.—Gutter for Door Sill.—J. A. Hemberger, Reading, Ohio.
96,234.—Plow Clod Fender.—James Higgins and J. W. Higgins, Orth, Ind.
96,235.—Wind and Tide Alarm.—G. M. Hoffman and Peter Hermas, Jr., Rahway, N. J.
96,236.—Traveling Trunk.—Thomas Hunt, New York city.
96,237.—Rubber Compound for Packing.—John Johnson, Brooklyn, E. D., N. Y.
96,238.—Hand Loom.—Abraham Jones, Clinton, Ill.
96,239.—Process of Reducing Wood and Woody Fibers for Paper Pulp.—V. E. Keegan, Boston Highlands, Mass. Antedated Oct 20, 1869.
96,240.—Railway Car Brake.—J. J. Kiser, Middletown, Ind.
96,241.—Method of Recovering Grease from Waste Soap Liquor.—William Koehler, Norwalk, Conn., assignor to J. M. Pendleton.
96,242.—Coloring Material for Dyeing and Printing.—Charles Lauth Paris, France.
96,243.—Fuel for Metallurgic Purposes.—C. E. Lester, New York city.
96,244.—Harrow.—J. S. Lewis, Elkader, Iowa.
96,245.—Compound for Treating the Human Hair.—W. R. Lount, Austin, Texas.
96,246.—Safe.—Egbert Macy, Brooklyn, N. Y.
96,247.—Washing Machine.—S. T. McDougall, Brooklyn, N. Y.
96,248.—Explosive Compound.—William Mills (assignor to himself, G. A. Lilliendahl, and J. J. Detwiller), New York city.
96,249.—Kerosene Stove.—R. B. Mitchell, Chicago, Ill.
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96,257.—Cigar Machine.—Charles Muller, Albany, N. Y.
96,258.—Carpenters' Plane.—Georg Muller (assignor to himself and Francis Barnet), New York city.
96,259.—Lavatory Attachment for Railroad Cars.—John G. Murdock, Cincinnati, Ohio.
96,260.—Gas Heater.—Hiram B. Musgrave, Cincinnati, Ohio.
96,261.—Tool for Cutting Tubes.—Thomas Nelson, Philadelphia, Pa.
96,262.—Steam Enginery for Motive Power.—Alfred Colerick Pilliner and James Charles Hill, Oakfield Works, near Newport, England. Patented in England January 28, 1868.
96,263.—Screw Driver.—J. C. Pinner, Newbern, Tenn.
96,264.—Sugar and Sorghum Mill.—D. J. Powers and Henry B. Stevens, Madison, Wis. assignor to D. J. Powers, assignor to Buffalo Agricultural Machine Works.
96,265.—Pneumatic Diaphragm Water Elevator.—Silas G. Randall Providence, R. I.
96,266.—Lounge and Sofa Bed.—R. M. Reeby, Worcester, Mass.
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96,269.—Medicine for Cancer.—Lawrence Roy (assignor to himself and Charles J. Nesbitt). Plattsburg, Mo.
96,270.—Lace-leader for Sails.—Daniel W. Sawyer, Booth Bay, Me.
96,271.—Combined Cultivator and Seeder.—Silas C. Schofield Chicago, Ill. Antedated October 16, 1869.
96,272.—Horse Rake.—Silas C. Schofield and A. Judson Wise, Chicago, assignors to Silas C. Schofield and Wm. D. Andrews, Rockford, Ill.
96,273.—Blind Hinge.—Alfred L. Seabury and Davidson Morris, Norfolk, Va.
96,274.—Oil Can Stopper.—Conard Seimel, Brooklyn, N. Y., assignor to Charles Pratt, New York city.
96,275.—Imitation Hair for Ladies' Head Dress.—Louise F. Shaw, New York city.
96,276.—Compound Rail.—E. R. Shepard, Scranton, Pa. Antedated October 16, 1869.
96,277.—Burglar Alarm.—Isaac Silvernail, Byron, Mich.
96,278.—Bridge.—Frederick H. Smith (assignor to Smith, Latrobe & Co.), Baltimore, Md.
96,279.—Cultivator.—J. A. Smith, Lacon, Ill.
96,280.—Apparatus for Elevating and Distributing Water in Buildings.—James L. Smith, Passaic, N. J.
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96,282.—Base for Bench Vises.—Anson P. Stephens (assignor to himself, Melvin Stephens, and Natnan Stephens), Brooklyn, N. Y.
96,283.—Cane Mill.—Henry B. Stephens, Buffalo, N. Y., and D. J. Powers, Madison, Wis., assignors to George L. Squier, Buffalo, N. Y.
96,284.—Steam Engine Piston Packing.—Edward Sullivan, Pittsburgh, Pa.
96,285.—Copying Press.—George Tangye, Birmingham, England.
97,286.—Hose and Pipe Coupling.—J. C. Thompson, Charlestown (assignor to himself and John H. Rogers), Boston, Mass.
96,287.—Wrench.—R. M. Thompson, Coshocton, Ohio.
96,288.—Fish Bait.—George T. Thorp, Philadelphia, Pa.
96,289.—Summer Furnace.—J. S. Van Buren, Green Island, N. Y.
96,290.—Cultivator.—Elisha Walker and Josiah J. Piatt, La Porte, Ind.
96,291.—Sash Holder.—Wm. M. Walton (assignor to himself and Joseph J. Walton), Newark, N. J.
96,292.—Photographers' Rest.—Edward L. Wilson, Philadelphia, Pa.
96,293.—Fender for Corn Plows.—Lewis C. Witt and W. F. Jones, Boston, Ind.
96,294.—Pruning Implement.—James R. Woodworth, Nunda, N. Y.
96,295.—Sash Holder.—J. C. Young, Toledo, Ohio.
96,296.—Straw Cutter.—Thomas N. Young, Richmond, Ind.
96,297.—Shoemakers' Last-holder.—Humphrey Calder and George Burgess, Richmond Va.

REISSUES.

75,836.—Horse Hay Rake.—Dated March 24, 1868; reissue 3,685. A. T. Barnes (assignor to "The Tiffin Agricultural Works"), Tiffin, Ohio.
86,644.—Settee Frame.—Dated February 9, 1869; reissue 3,686.—Thomas J. Close, Philadelphia, Pa.
16,266.—Machine for Folding Paper.—Dated December 23, 1856; reissue 3,687.—Charles A. Durgin, New York city assignee of Chauncey O. Crosby.
86,835.—Process of Utilizing the Waste Products of Combustion for the Manufacture of White Lead, and for other Purposes.—Dated February 9, 1869; antedated February 1, 1869; reissue 3,688. Henry Hannen, Thomas Woods, and Benjamin F. Pine, Philadelphia, Pa., assignees of Henry Hannen.
12,723.—Machine for Punching Metals.—Dated April 17, 1855; extended seven years; reissue 3,617, dated August 24 1869; reissue 3,689.—Charles Parker, Meriden, Conn., assignee of George Fowler and the administrators of the estate of De Grasse Fowler, deceased, namely, Maltby and Sophronia Fowler.
39,235.—Rock Drill.—Dated July 14, 1863; reissue 3,304, dated February 16, 1869; reissue 3,690.—Asahel J. Severance, Middlebury Vt., assignee, by mesne assignments, of Rudolph Leschot.
58,455.—Spice Box.—Dated October 2, 1866; reissue 3,691.—Division A.—Joseph H. Steele, New Haven, Conn., assignee of Wallace A. Miles.
58,455.—Spice Box.—Dated October 2, 1866; reissue 3,692.—Division B.—Joseph H. Steele, New Haven, Conn., assignee of Wallace A. Miles.
80,375.—Tape-roll Clip Fastening.—Dated July 28, 1868; reissue 3,693.—Marcus Brown, Westhead, Manchester, England.

DESIGNS.

3,724 and 3,725.—Tack Head.—Orin L. Bassett (assignor to the Taunton Tack Company), Taunton, Mass. Two patents.
3,726.—Anchor.—Frederick Dellicker, Trenton, N. J., assignor to The East Trenton Porcelain Company.
3,727.—Covering Trunks.—Jonathan Smith Eaton, Boston, Mass.
3,728.—Fork or Spoon Handle.—George Sharpe, Philadelphia, Pa.
3,729.—Flower Shade and Pedestal.—Elizabeth Mary Stigale, Philadelphia, Pa.
3,730.—Printers' Type.—George Wm. Witham (assignor to MacKellar, Smiths & Jordan), Philadelphia, Pa.

EXTENSIONS.

Sewing Machine.—Isaac M. Singer, New York city.—Letters Patent No. 13,661, dated October 9 1855.
Grain Separator.—Peter Geiser, Waynesborough, Pa.—Letters Patent No. 13,644, dated October 9, 1855.
Chimney Stack.—B. F. Miller, New York city.—Letters Patent No. 13,620, Dated October 2, 1855.
Dust Deflector for Windows of Railroad Cars.—James M. Cook, Boston, Mass.—Letters Patent No. 13,676, dated October 16, 1855.
Wash Board.—Joseph Keech, Waterloo, N. Y.—Letters Patent No. 13,682, dated October 16, 1855.
Faucet.—Albert Fuller, New York city.—Letters Patent No. 13,677, dated October 16, 1855; reissue No. 752, dated July 5, 1859.

Inventions Patented in England by Americans.

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

PROVISIONAL PROTECTION FOR SIX MONTHS.

2,746.—Purification of Spirits or Alcoholic Liquids and Apparatus therefor and the Separation of the Lighter from the Heavier Particles of Oils and other Liquids.—R. D. Turner, New York city. September 21, 1869.

2,758.—Thrashing Machine.—A. S. Whittemore, Willimantic, and J. E. Atwood, Mansfield, Conn. September 22, 1869.

2,824.—Manufacture of Horseshoe Nails and Apparatus therefor—J. D. Kingsland, Burlington, Vt. September 28, 1869.

2,826.—Harvester.—T. Fawcett, Pittsburgh, Pa. September 28, 1869.

2,250.—Mail Bag, etc.—John Dewe, Toronto, Canada. July 24, 1869.

2,777.—Car Brake.—A. I. Walker and T. E. Whitcomb, Lynn, Mass. Sept. 24, 1869.

2,807.—Sized Paper.—H. C. Hulbert and Z. C. Warren, Brooklyn, N. Y. September 27, 1869.

2,811.—Embroidering Looms.—K. Adams, South Orange, N. J. Sept. 27, 1869.

2,813.—Knitting Machine.—H. A. House, Bridgeport, Conn. September 27, 1869.

2,825.—Apparatus for Preventing Alteration of Values in Monetary Instruments.—M. E. Berolzheimer, New York city. September 28 1869.

2,827.—Aerial Carriage.—F. Marriott, San Francisco, Cal. September 29, 1869.

2,846.—Lock.—J. Dewe, Toronto. Canada. September 30, 1869.

2,851.—Screw.—W. A. Ingalls, Chicago, Ill. October 1, 1869.

2,855.—Sewing Machine.—B. P. Howe, New York city. October 1, 1869.

2,863.—Buckle for Cotton Bands.—J. S. Wallis, New Orleans, La. Oct. 2, 1869.

2,869.—Construction of Vaults, etc.—T. Hyatt, Atchison, Kansas. Oct. 2, 1869.

2,882.—Forging Bolts, etc.—W. Horsfall, New York city. October 5, 1869

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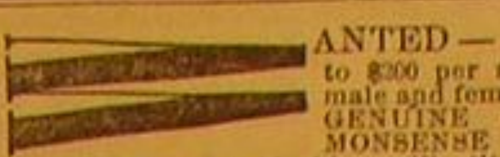

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