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THE KANSAS WHIRLWINDS.

On the evening of May 30, a severe storm swept over portions of Kansas, Nebraska, and Missouri, developing locally two or more whirlwinds of limited scope,—but of terrific violence. The severest of these appears to have formed on the Salina river, Kansas, crossing the country to Solomon river, thence northeastward into Nebraska. Much of the country traversed has been but recently settled, and in the absence of complete telegraphic communication, it is impossible to form a connected idea of the course of either of the whirls, or to gain any definite idea of the destruction wrought by them. Forty or fifty persons are reported killed and wounded; and many houses were wrecked at points so situated as to make it certain that no single whirlwind could have done all the mischief. Even where a definite line of disaster can be traced on the map, it takes a curiously zigzag direction; and local reports describe the main course as having been diversified by many remarkable loops and curves.

In their general features, the whirls substantially repeat those of the whirlwind that wrecked the town of Richmond, Mo., just a year before. There was the same sort of funnel-shaped cloud, with its terrific rotary motion and irresistible suction, sweeping across the country with a writhing motion, leaving in its track a looped and sinuous line of ruin and death. Whatever came within its range was lifted bodily, torn to pieces, and scattered broadcast over the country. Nothing was blown down; everything was twisted and whirled into promiscuous ruin. Horses, cattle, and hogs were caught up and carried to considerable distances, then thrown aside, crushed often into shapeless masses. In some places the track would be straight and narrow; at others the terrible meteor would sway from side to side, leaving a belt of partial destruction half a mile wide, with here and there a section entirely unharmed, perhaps an island-like space in a loop of complete devastation. In one of these loops, it is said, a house remains undisturbed, though the terrible whirl passed closely all around it.

Our engraving shows, as well as a single drawing can, the general aspect of whirlwinds of this nature. The artist, Mr. Davidson, has had the good fortune to witness one or more of these unwelcome visitants, without experiencing its immediate effect, and has given an accurate picture of their appearance. It is impossible for the most lively imagination, uninstructed by actual observation or experience, to form any adequate idea of the imposing grandeur or the terrific force of whirling storms. The forward motion of the whirl may be not more rapid than that of a stiff breeze; yet the actual speed of the wind in the whirl would seem to be immeasurably great. It is impossible to estimate the resistless violence of the air movement at such times. Houses

THE KANSAS WHIRLWINDS.

are swept up like straws, heavy wagons and machinery are crushed and carried for long distances, and the toughest trees are twisted off like reeds. The electrical action in connection with these murderous whirls is naturally excessive, but the immediate rainfall is apt to be slight.

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For the Week ending July 5, 1879.

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A PATENT RIGHT DISCUSSION IN ENGLAND.

At a meeting of the Society of Arts, in London, May 7, a paper was read by a member reviewing the salient features of the government patent bill now before Parliament, and in the discussion that followed a number of prominent gentlemen took part. There was also read a long letter from a committee of Glasgow inventors, pointing out some of the more objectionable features of the proposed law, and approving the motion now on the notice paper of the House of Commons, to the effect that no measure or change in the patent laws would be satisfactory if it continued to treat inventors as public enemies, to be impeded and heavily taxed, instead of legislating so as to stimulate the inventive genius of the nation to bring improved machinery and labor-saving appliances to the aid of the depressed industries of the country.

The circumstance that several of the obnoxious features of the bill under criticism were those which would-be reformers of the American patent system insist on our adopting, gave unusual interest to the discussion from an American point of view. Two points were especially noticeable: the emphasis laid upon the justice and sound policy of respecting the natural rights of inventors, and the general acknowledgment of the superiority of the American patent law in securing the end aimed at—namely, the encouragement of invention.

The chairman of the meeting, Mr. F. J. Bramwell, said that the grudging assent given to the necessity of a patent law by those who looked upon patentees as in some sense adversaries of the public at large, was altogether unreasonable. Dr. Siemens had put the matter most pithily in saying that if an invention should be found lying in the gutter, it would be better that an owner should be assigned it, rather than have it left as common property. With an owner it would probably become a public benefit; without an owner it would most likely be left unused. So far from its being the desire of persons engaged in manufacture to adopt new inventions, the truth was that such persons dreaded nothing more, and naturally. When they had their machinery set up to work a certain process, and their workmen trained to use it, they were not too ready to adopt any new idea that came before them. It simply placed them in the dilemma of either leaving it alone, which would be the easiest thing to do, or adopting it, perhaps at enormous expense. Of course they would be inclined to leave it if they could without risk of their rivals getting ahead of them. Except in the case of very enterprising men, who wish to push themselves forward, the tendency of manufacturers is to let inventions alone. An inventor is generally a man not engaged in the trade he improves, and such men are very unfavorably placed for carrying out their inventions. Without capital, business knowledge, or connections, they are incapable by themselves of developing their inventions; but protected by a patent, they can go to a capitalist and induce him to bring their invention forward by offering him special privileges for so doing. Mr. Bramwell happily sums up in one sentence the vital objection to the government bill, an objection which reminds us of the bill before Congress last winter: "There seemed to be a desire in the minds of the framers of the bill to take advantage of the invention without protecting the inventor, and the prevailing idea seemed to be that if the public could get something without giving an equivalent in the shape of protection to the inventor, it would be so much gain." The futility of expecting to gain by such a transparent swindle would seem to need no insisting on except to such statesmen as would expect a country to profit by the repudiation of its honest debts.

Mr. Anderson, Member of Parliament, insisted that there was really no difference between the interests of the public and of inventors in the matter, and that to stimulate the inventive genius of the country would be most beneficial to all. In fact, after considerable experience, he had come to the conclusion that two things were necessary to put English manufacturing industry in a satisfactory position, and they were technical education, as given on the Continent, and the conferring of liberal patent rights, so that inventive genius might be induced to come forward. An instance of the results of liberal patent laws was furnished, he said, by America. Most modern inventions came thence, not because people's brains were more inventive there, but on account of facilities and encouragement given by American patent regulations.

Admiral Selwyn said that if the English people desired to restore their country to her former proud position among the nations of the globe, it would be in vain to rely on free trade or anything else. Nobody could fail to see that if the patent fees were made as low as in America, ten times as many patents would be taken out. The opinion that three or four years were sufficient to determine the practicability of an invention was not well founded. The Bessemer process, for instance, was not accepted until twelve years after the invention was put forward, and such a fact as that should justify the endeavor to fence the inventor round with such protection as would induce capitalists to put inventions into operation. There were in the Patent Office hundreds of inventions which had been brought forward before the public were ready to adopt them, though calculated to be of the greatest benefit to humanity; but they now lie idle there because they cannot be repatented. Inventors were the prophets of their day, pointing out the path to material progress, as the prophets of old showed the path in morals, "and we treat our prophets exactly as our forefathers treated the prophets of their time."

After noting at length certain features of the American patent system as commendable and worthy of adoption—small fees, extended life, paid commissioners, payment for inventions adopted for government use, and so on—Admiral Selwyn said, that as representative of the British section of the International Congress of Paris, he could assure the society that the prevailing idea there was that the nation which gave the best protection to inventors would take its place in the fore-front of progress, and that by no other means than recognizing that an inventor was a benefactor of every state, could true progress be achieved.

These are a few of the points brought out in the discussion, points having a direct bearing on the patent question as it stands in this country. They are noteworthy as confirming the wisdom of the founders of the American patent system in making it first of all accessible to all men and a real encouragement to inventors. No other patent system has come so near doing exact justice to inventors, and none has approached it in the accomplishment of its grand purpose, the advancement of the useful arts. This the friends of industrial progress are recognizing more and more clearly everywhere; and in every civilized country the best informed statesmen are pointing to this country as an exemplar of the practical advantages of dealing justly and liberally with inventors. Yet we doubt not there will appear before Congress next winter, men calling themselves statesmen and friends of progress, who will insist that patents do not encourage invention, that the country is oppressed by patent monopolies, and that the only way to save our industries from stagnation and destruction is to tie up our inventors and let loose the infringer.

MAGNETIZING MOLTEN IRON.

In a letter to Dr. C. W. Siemens, and communicated by him to the British Society of Telegraphic Engineers, Mr. E. Chernoff records a very curious experiment. Believing that if it were possible to magnetize white cast iron a magnet of greater permanence than any made of steel would be obtained, Mr. Chernoff cast some white refined iron in a mould, surrounded by an electro-magnetic reel, along which a current was allowed to flow during the process of casting, so that the fluid metal became magnetic, and cooled under the influence of the magnetic current.

The result so far justified the expectation as to give a magnetized bar of white cast iron; but the form of the bar was unlike what was expected. While pouring the metal into the mould and until the metal set, Mr. Chernoff observed a singular agitation of the metal, which could not have proceeded from damp, as the mould was thoroughly dry. On cooling the bar proved to be hollow, the cavity being symmetrical and extending about two-thirds the length of the bar. The metal was thinnest just opposite the center of the reel, where it did not exceed the thickness of writing paper. The agitation of the metal in cooling is accounted for by the repulsion of the molten metal toward the poles of the magnet.

By casting under pressure it may be possible to obtain by this method extremely permanent and powerful magnets of white iron. Possibly also this experiment may lead to some useful modification of industrial processes for casting hollow cylinders without cores.

A NEW THEORY OF THE EARTH'S MAGNETIC POLES.

From a study of the movement of the compass-needle producing declination at London, Mr. B. G. Jenkins, of the Royal Astronomical Society, has become convinced that the various vicissitudes of the needle during the last 300 years can best be explained by the supposition of a strong magnetic pole above the earth's surface, and revolving around the geographic north pole in about 500 years. He finds four magnetic poles, as maintained by Halley and Handsteen, to be necessary to explain satisfactorily all the phenomena of terrestrial magnetism, but he places these not in the earth, but in the atmosphere. These poles he regards as the free ends of as many broad magnetic belts, two extending from the vicinity of the north pole to the equator, the other two coming up from the south pole to meet them, the boreal magnetism of the northern belts uniting with the austral magnetism of the southern belts along the magnetic equator. These bands he believes to revolve at slow and unequal rates round the poles of the earth, producing secular variations.

It will be observed that Mr. Jenkins describes the magnetism of the northern hemisphere as "boreal." Contrary to the current theory, he holds that the north end of the compass needle is a true north pole, and that the facts observed are, when properly understood, in full accord with the great magnetic truth that like poles repel and unlike poles attract.

After submitting the evidence in favor of this view, Mr. Jenkins argues in this wise: If the north end of the dipping needle is a south pole, its pointing to the ground in Boothia (where Sir James Ross located the earth's north magnetic pole) must be attributed to attraction. If it is attracted it is attracted by something either in the crust of the earth or at the center of the globe. If there is something in the earth's crust which attracts the needle in Boothia, it ought to attract the needle in London. But the needle in London is attracted neither to the crust at Boothia nor to the earth's center. The truth is, Mr. Jenkins believes, that the north pole of the needle pointed to the ground almost perpendicularly in Boothia because it was repelled by the true north

magnetic pole in the atmosphere above that region when Sir James Ross was there fifty years ago.

Further evidence as to the existence of the alleged magnetic belts above the earth's surface is promised. Meantime it is of the first importance, Mr. Jenkins thinks, that it should be clearly settled whether the magnetic pole remains in or above Boothia. According to his calculation it should now be in lat. 72°, long. 115°, in Prince Albert Land.

OBJECTIONS TO SELF-PROPELLING FIRE ENGINES.

Owing to the practical difficulties in the working of self-propelling fire engines and doubts as to their relative efficiency, the New York Fire Department lately called for reports from the battalion chiefs with regard to the engines in use here. An opinion was also asked from the chief of the department, Mr. Eli Bates, who states the main objections to them as follows:

"Ninety pounds of steam pressure is required to be kept on the boiler continually for the purpose of conveying them to a fire, the result of which is that the continual pressure weakens the boiler, and more repairs are required than to the boilers of horse engines. The engines and pumps are used in going to and returning from fires, thereby causing considerable wear and tear on the machinery. They cannot be conveyed to and from a fire (especially when there are snow and ice in the streets) as safely as a horse engine. The wear and tear on the running gear exceeds that of a horse engine on account of the additional weight and the sudden strain when the motion is reversed, and when there is deep snow on the ground it is not a certainty that they can reach a fire without horses. With horses attached to them and assisted by steam power in heavy wheeling they are the best. They cannot be used by the department generally (the same as horse engines), but only in companies where the officers and men have been specially trained to the handling of them, and this cannot be acquired without long experience, during which time they are liable to meet with serious accidents. I would further state that I consider them more liable to cause fires from cinders than the horse engines while going to and returning from fires, especially in localities where light and inflammable goods are hanging in front of stores or on awnings."

It would appear from the above that further invention is needed before the steam fire engine can be called a perfected machine.

THE PROSPECTS OF TEA CULTURE.

That it is possible to grow good tea in this country is beyond doubt. That by the cultivation of a few bushes in garden plats a great many American families may be able to secure a small quantity of finer tea than can be had in the market, without calling in outside help and without seriously increasing domestic care and labor, is quite probable. That it will ever pay for Americans to undertake tea growing as a business is altogether another matter. No doubt mechanical improvements in the processes of tea gathering and curing may greatly diminish the cost of labor; but the same improvements can be introduced elsewhere, and ultimately the American tea industry would have to compete on unequal terms with that of China, India, Japan, and other lands.

The question of future competition among existing tea growing countries is seriously considered by the *Indian Tea Gazette*, of Calcutta, in discussing the prospects of Indian tea. After reviewing hopefully the immediate prospects of tea culture in India, the *Gazette* insists that great caution is required in the extension of the tea industry.

"Doubtless the tea drinkers in the world are increasing greatly year by year, but, alas! so is the produce. It is not now a case of India *versus* China; it is India *versus* China, Java, Japan, Ceylon, etc. It is certainly quite on the cards that in a few years the supply will exceed the demand. No one can say that it will be so; equally can no one say that it will not be so. But so much we can and do say: that, with things as they are to-day, he is not a wise man who embarks in tea cultivation, or who extends the area he has at present, except all the conditions for success are pre-eminently to the fore. We think where these all exist tea will pay for ever and a day; but their existence, all combined, is quite exceptional. To give the sum of our advice in a few words: we would not ourselves, as things are, plant tea in any but the best tea climate and on any but perfectly flat land—not unless we could eventually look for more than 6 mds. (600 pounds troy) per acre—where the communication is not good, and where any difficulty does now or may hereafter exist as to labor."

At this rate the prospect of any great development of tea culture in this country is not alarmingly brilliant.

THE DISEASES OF BUILDING TIMBER.

In an article on this subject the *Building News* remarks that it seems an odd thing that timber trees should be almost as liable to disease as man is; but it is undoubtedly true, and the disease, in the case of trees as well as of man, arises from preventable causes. Dr. James Brown states that the principal diseases likely to be brought on forest trees by bad management are: (1) bark binding, (2) lichen growth on the bark, (3) stag-horn tops, (4) scale, (5) premature seeding, (6) dropsy, (7) ulcers, (8) wounds, and (9) stunted growth of the young wood. Now, in addition to these defects, we have in the manufactured timber such matters to contend with as doatiness and the excess of sap and weariness, concerning which so many complaints are made.

The disease called "bark bound" is caused by the bark being girded or bound about the wood of the tree, thereby preventing the proper flow of the sap, and also arresting the descent of woody matter between the wood and bark. If the cause of this disease be not remedied in time, the vital fluids become gradually checked, till at length the passages become entirely closed, and, as a natural consequence, the tree dies.

The appearance of lichens on the bark of trees is not always a symptom of disease, but may be occasioned by a temporary derangement of the outer bark, and if observed in time, diseases may be arrested by removing the cause before it has had time to become decidedly fixed in the constitution of the trees affected.

Willows and poplars, which luxuriate in a soil rather damp than otherwise, generally become staghorn-topped when grown in a soil too dry for their healthy development. Elm, oak, ash, plane, etc., generally become in the same condition when the soil in which they are grown is too damp to maintain them in a healthy state.

"Scale" is a small white insect found clinging to the bark of some species. In forest trees it is usually found upon the ash while in a young state. These insects appear like very numerous small white spots, like those on the bark of the birch.

As to premature seed-bearing, it may be said that trees in a healthy, rapid growing state are seldom found to produce seed till they have arrived at a considerable age and size. Generally speaking, any forest tree under forty years of age bearing much seed is not likely to arrive at a valuable size. When a young tree produces a profusion of seed there can be no doubt that it is in a state of premature decay, and we may be assured that it will not become valuable as timber.

Dropsy generally takes place in forest trees either where the soil is too rich for them, or where there is an excess of moisture about the roots. The cause appears to be that the roots absorb into the system of the tree an excess of juice, which the leaves and bark cannot assimilate. In this disease unnatural swellings are observed on some part of the stem, and which begin to rot and throw off the bark. It is incurable, and the only thing to do is to prevent it by proper draining of the ground and seeing that it be not over rich.

An ulcer much resembles dropsy, but it is mostly confined to the larch and others of the coniferous tribe. Its appearance is that of a running sore upon the side of the stem, where the natural juices escape in the form of a hard resinous matter. This disease is mostly found upon young trees of this order, and is frequently occasioned by insects lodging their eggs in the inner bark, where the young live for a time and destroy the alburnum.

Wounds are often caused by the trees receiving damage on their stems by having the bark peeled off by accident in some way or other, and may not only prove injurious to their health, but also be a frequent cause of death. But any simple wound made upon a healthy tree is seldom or never found injurious, but soon heals up.

The stunted growth of young wood is at once apparent by the very short annual growth of young wood upon all the lateral branches, and may be in general the natural result of any of the diseases already described. Every tree, when it has attained its full size and development of its nature, however healthy it may have hitherto been, gradually begins to fail in making young wood. This is the work of time, doing to the old tree what the disease does to the young.

"SCIENTIFIC CREDULITY."

A striking illustration of the anti-scientific bias which prevails in certain spheres of culture is afforded in an article in the London *Spectator*, wherein that clever journal moralizes at great length over what it calls scientific credulity. The occasion is an ingenious hoax perpetrated last winter by an Australian newspaper and widely circulated since. The *Spectator* says:

"The story having appeared in the *Times* without comment has, of course, been republished everywhere, and it is amusing to see that in many instances those who republish it think it necessary to be cautious and repudiate total disbelief. So many wonderful things, they say, and in especial one London journal says, have turned out true that it would be rash to declare this one certainly invented. There is a disposition perceptible to think there may be something in it, though not all that is alleged, and that as Mr. Edison has bottled sound, so Signor Rotura—an Italian name was probably chosen because an Italian has made the most recent and successful experiments in embalming—may have bottled life; that as sound may be re-echoed weeks after it was first heard, so a lamb may skip about after it has been some weeks frozen. As there is an electric telegraph why should not death be baffled? That is a very curious instance of a new form of credulity which is growing up among us, a credulity which is not faith, but rather disbelief, so far-reaching that it causes a certain powerlessness of mind, an inability to reject at once and decidedly anything that even puts on the appearance of 'science.' The incapacity to weigh evidence—to see, for example, that for this story there is absolutely as yet no evidence at all, any more than there is evidence for the authenticity of Bulwer Lytton's 'Strange Story,' that there is no witness produced, or promised, or named, nothing but an unauthenticated narrative—is a phenomenon we are all well acquainted with; but this sort of credulity differs in kind from that. It would almost seem as if the advance of science had in some minds decreased the capacity for using the scientific method, as if their confidence in the usual data for reasoning had been gradually so upset that they did not trust them any longer, and did not see why, a far off locality being granted, parallel lines should not meet, or the whole be smaller than the part. That would not, they think, be much more surprising than the phonograph. We observed only a little while ago a statement going the rounds of the newspapers that a certain Texan had eaten his own weight in meat at one sitting, no one apparently perceiving that if that were true then a pint bottle could hold a quart, and reasoning of any kind, even the reasoning necessary for arithmetic or mensuration, was entirely useless and unmeaning. The great truth that if two plus two can be five, counting is nonsense, and that the terms of any conceivable sum in arithmetic would all shift, seems to have lost some of its hold, to the indefinite injury, if the want of gripe became general, of human reasoning power. That is at all events a strange result of the progress of scientific discovery, and it is all the stranger because the new credulity is almost confined to the action of 'science' itself. People are not generally more credulous. They do not believe in each other more than they did, or in unusual events more than they did, and they believe in the supernatural a great deal less than they did. If the Archbishop of Canterbury and Lord Houghton and Professor Tyndall all declared that they saw and spoke with a sentient being possessing a body clearly not human, all journalists would at once accuse them either of falsehood or hoaxing or a very suspicious condition of brain and eyesight; but if they all declared they had seen a man swallow a drug which turned him all over both yellow and blue at the same time, the statement would be printed everywhere as the last 'medical marvel.' Yet the former assertion, though requiring, of course, unusually complete evidence, would involve no greater impossibility than the existence of any supernatural being does—which existence half the incredulous accept—while the latter is a contradiction in terms, and no more capable of proof than the assertion that on one occasion and in the usual conditions of the world, water being still water did outweigh mercury, which was nevertheless still mercury. There is the greatest reluctance even to consider any statement involving an acceptance of the supernatural combined with the most childlike readiness to swallow anything which can be described as a mechanical, medical, or mental marvel."

The *Spectator* goes on, at greater length than we have space for, to illustrate the various phases of this "new form of credulity," which is indirectly charged to the progress of science. Science has done so much that its disciples are half inclined to believe it can do anything, the *Spectator* would have us think. But this credulity as to the power of science is very far from being the state of mind which prevails among the scientifically minded. Over credulousness as to the possibilities of science is the weakness of those who know least of the real character of scientific achievements. In other words, credulity is a condition of ignorance and the lack of rational culture. And the success of scientific hoaxes, so-called, only measures the wide and varied unacquaintance with scientific truths among reputedly intelligent people. To blame science for this is about as absurd as it would be to blame civilization for the unreasonable beliefs with regard to the powers of civilized men current among certain savages. It is the absence of civilization or science in either case that makes the false idea tenable.

The circumstance that many who are very skeptical with regard to alleged supernatural occurrences unsupported by sufficient evidence, are yet over-ready to accept scientific marvels, simply proves that their education is not half completed. They know too little of science, and have had no real training in scientific habits of thought. The *Spectator* says that men are as credulous now as ever; that the popular appetite for the marvelous has not been diminished by the progress of science, though its direction has been changed; so that men now look to scientific instead of supernatural agencies for its gratification.

"The process of god making, so often repeated by humanity, is going on again, and Nature is being endowed with attributes which imply an absence of conditions and enveloped in the very atmosphere of awe which once surrounded the supernatural," which is true only so far as men have not yet been brought directly under the influence of scientific culture. Just so far as men are ready to accept without evidence any assertion made in the name of science we may be sure that they are ignorant of the first great lesson that science has to teach, and that their minds have lacked the training which comes through the acquisition of knowledge by scientific methods. "Scientific credulity" is a contradiction in terms. Credulity is essentially unscientific.

A Large Block of Stone.

One of the largest blocks of granite ever cut in the United States has recently been taken from the quarry at Vinalhaven, It is 59 feet long, 5½ feet square at the base, and 3½ feet square at the top. It weighs from 75 to 100 tons. It cost $1,700 to quarry it and move it to the shed where it is to be finished. It is to foot the shaft of the monument to General Wool, to be erected at Troy, N. Y. The shaft, with the base stones, will form a structure of about 75 feet high.

PROTECTING LEAD PIPE.—The *Revue Industrielle* says that the interior of a lead pipe can be covered with an incrustation of sulphide of lead by making a warm concentrated solution of sulphide of potash flow through it for ten or fifteen minutes. Pipes thus treated seem to be covered with grayish varnish, which prevents the water flowing through them from acting upon the lead.

RECENT AMERICAN PATENTS.

An improved device for exhibiting diamonds and other precious stones to purchasers, to enable them to judge of their effect when worn, has been patented by Mr. Leon P. Jeanne, of New York city. It consists of a clamp of peculiar shape, provided with notched arms and claws, for holding the gem, and an ear wire or hook.

Mr. F. D. Thurman, of Atlanta, Ga., has patented an improved harness for horses. It consists in a rigid yoke open at the bottom and closed or bent over at the top, connected with the shaft, and provided with tugs and a girth or belly band for holding the yoke and shafts down to their places.

A bottle stopper, especially designed for bottles containing beer, mineral waters, and other effervescing liquids, has been patented by Mr. W. H. G. Savage, of Kingston, Ontario, Canada. A cam pivoted to the stopper and to a rigid standard serves to hold the stopper in place and to release it when required.

Messrs. A. A. Moore and Robert Cameron, of Trinidad, Col., have patented an improved fastening for horse collars, to take the place of the usual leather strap and buckle. It consists in a hinged metal strap attached to one part of the collar, and arranged to engage pins on a buckle plate on the other side of the collar.

An improved sleeping car berth has been patented by Mr. Frederick C. Hills, of Sioux City, Iowa. The object of the invention is to furnish a guard for preventing sleepers from rolling out of the upper berths of cars and vessels, and to prevent the berths from shutting up should the car be overthrown.

An improved gauge for applying lace to goods for trimming ladies' dresses, and for other purposes, has been patented by Mr. Joseph A. Denais, of Jersey City, N. J. It consists in a combination of U-shaped plates and sponge holders with a base plate.

An automatic device for filling drinking troughs for cattle from ponds and shallow wells, has been patented by Mr. W. L. Lankford, of Mirabile, Mo. It consists of a pipe leading from the pond to the trough, having a valve at the upper end, and a stem running through the pipe and pivoted to a float in the trough. The flow of water is controlled by the float.

Mr. George J. Record, of Conneaut, Ohio, has patented an improved casing or jacket for butter packages and other vessels, which may be removed and put on when required, the object being to keep the package neat and clean, and to protect it from injury.

An improved apparatus for evaporating and calcining alkaline solutions has been patented by Mr. H. L. Orrman, of Berlin Falls, N. H. It is designed for recovering the caustic soda contained in the alkaline solution or waste liquor from the chemical treatment of wood in the manufacture of wood pulp.

Mr. Edwin V. Heaford, of Covington, Ky., has patented an improvement in adjustable pattern plates for draughting garments. It contains the outlines of the garment and the details of the seams and various parts. To produce a perfect fitting draught, it is only necessary to adjust the pattern to the person and then lay it on a piece of paper and mark it out.

An improved honey knife, for uncapping comb cells, has been patented by Mr. Oliver J. Hetherington, of East Saginaw, and Tracy F. Bingham, of Abronia, Mich. It consists of a honey knife having a flange or cap arrester upon its rear edge.

Mr. Samuel Hower, of Cressona, Pa., has patented a box or cabinet for post office use, for facilitating the work of stamping letters and canceling stamps in small post offices. It consists of a small box or cabinet of suitable dimensions, to lie upon a post office table, divided into a number of compartments, and containing canceling stamps, tickets, etc.

An improvement in heels for boots and shoes has been patented by Mr. Benjamin Bradshaw, of New York city. It consists of a plate provided with a male screw attached to the sole of a boot or shoe, and a plate having a female screw attached to the heel. A heel attached by this device may be easily removed and replaced.

An improvement in mash tubs, for holding and mixing the mash, has been patented by Mr. Gottleib Young, of Columbia, Pa. It consists in the peculiar construction and arrangement of stirring devices, and a false bottom, which facilitates drawing off the liquor.

Mr. Wm. L. Pitts, of Cerro Gordo, Ill., has patented an improved device for holding swine, which consists of tongs having V-shaped jaws, one of the jaws being provided with a round-headed pin, which enters the cavity between the sides of the animal's lower jaw and prevents the tongs from slipping.

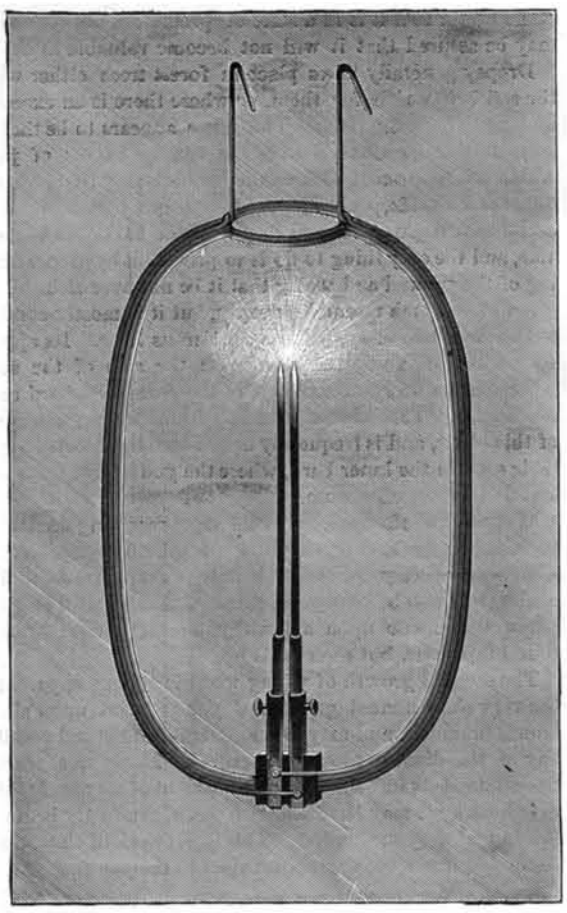
An improvement in refrigerators, patented by Mr. Joseph P. Ast, of Staunton, Va., which consists in combining with the outer case of the refrigerator and the ice box, a series of separated parallel strips, which give direction to the circulating currents and strengthen the ice box.

An improvement in artificial pivot teeth has been patented by Mr. J. W. Holt, of Goldsborough, N. C. It consists in providing each tooth with a metal tube set into it when moulded, and burned in when the tooth is baked. The object of the invention is to provide a pivot hole of sufficient depth and size to admit of using a strong pivot.

An improved cam for stamp mills, patented by Mr. James Scott, of Denver, Col., is constructed so that the hub may be keyed to the shaft independently of the cam arms. This arrangement admits of adjusting the cam arms, and renders it easy to detach either of the cam arms and replace it with a new one, without interfering with the other.

NEW ELECTRIC LAMP.

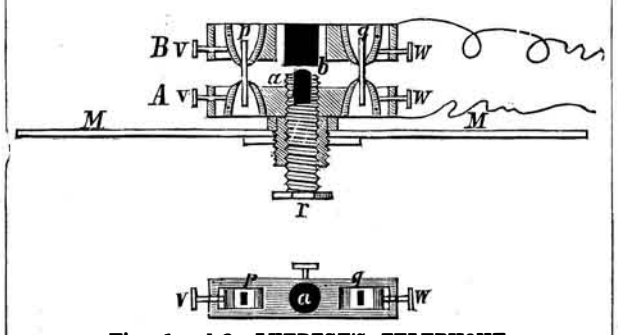
M. Jamin surrounds two nearly parallel carbon sticks with an elliptical coil of wire, through which passes the current which gives the light. This lamp is shown in the annexed engraving, which we take from *La Nature*; the coil, being in the same vertical plane as the carbon rods, is arranged so that the current through it is in the same direction as that which flows through the latter, producing the arc at their extremities. In virtue, therefore, of the law that currents in the same direction attract and those in opposite directions repel each other, the currents through the upper portion of the coil will attract the arc, and those through the lower portion will repel it. The lateral currents also, by reason of their tendency to deflect the arc into parallelism, aid in repelling the latter to the extremities of the carbons. So powerful is this effect of repulsion that, if the number of turns of wire in the coil be too great, the arc, if caused to pass between the lower portions of the carbon rods, will move upward with great velocity, and the light becomes extinguished, owing to the arc being too strongly attracted in the direction of the extremities of the carbons. With this apparatus the arc becomes strongly curved; and it is stated that the light evolved is very considerably augmented by its use, owing to the carbons being no longer consumed laterally, so as to shade the light. By using this apparatus, also, the lamp may be inverted, without any danger of the arc quitting the extreme ends of the carbon rods. These appear to be important advantages gained in the solution of one of the main questions in connection with electric lighting.



M. JAMIN'S ELECTRIC LAMP.

LUEDTGE'S UNIVERSAL TELEPHONE.

Dr. Luedtge, of Berlin, whose microphone, or, as he calls it, universal telephone, was patented January 12, 1878, some time before the microphone notes of Hughes and Edison were published, has lately improved his instrument to such a degree that it will probably answer all reasonable demands for telephonic conversation. The disagreeable sounds that are heard in other microphones have been avoided, and words spoken into the transmitter are reproduced so clearly and so loud that it can be heard best a short distance from the receiver, which is an ordinary Bell telephone. With it a healthy ear might be injured. If, however, persons that do not hear well place the receiver near the ear they are able to hear much better than with other similar instruments.



Figs. 1 and 2.—LUEDTGE'S TELEPHONE.

Words have been plainly transmitted by this apparatus through a distance of 186 miles. A special signal is not necessary. If a Bell telephone and a Luedtge microphone are brought in connection, a clear, deep, and impressive tone, somewhat like the tone of a fog horn, which can be heard for quite a distance, is perceived at the transmitting as well as at the receiving station.

The essential part of the instrument is the connection between the two electric conducting bodies, *a* and *b*, Fig. 1 (preferably of iron, platina, or carbon). One of the pieces, *b*, is level at the contact surface, but the other, *a*, is rounded. The electric current passes through this contact, and the variations in the electrical resistance at this point, while speaking, cause the vibrations of the membrane in the receiving telephone.

Fig. 3.

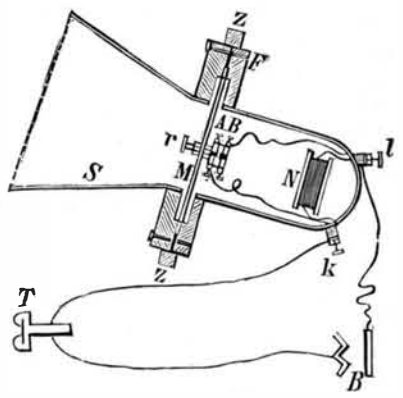


Fig. 3.—LUEDTGE'S TELEPHONE.

A peculiarity of Luedtge's construction is that both of the contact pieces are united to a support fastened to the middle of the membrane, M, so that both vibrate with the membrane. The contact piece, *a*, rests in a rectangular brass frame, A. The contact piece, *b*, is supported in a similar manner by the frame, B. The two frames, A and B, are connected to each other by means of the strips of caoutchouc, *p* and *q*. Caoutchouc is a poor conductor of tone vibrations. The tone vibrations transmitted to the membrane, M, are received by the contact piece, *a*, unimpaired and with their entire power, but to affect the contact piece, *b*, they must pass the rubber strips, *p* and *q*. By this contrivance their intensity is materially decreased or modified, and there is a difference in the vibrations of *a* and *b*.

The small screws, *v* and *w*, serve to regulate the compression of the caoutchouc strips, *p* and *q*.

Fig. 2 is a transverse section of the complete apparatus. S is the tone receiver, M a wooden diaphragm, F the casing of the same, Z Z pivots for hanging the apparatus in bearings. A and B are the contact frames; R is a screw for partially regulating the contact by moving one of the contact pieces; *k* and *l* screws for fastening the wires; B is the battery; T the receiving telephone; and N a resistance coil.

To adjust the apparatus very carefully it is turned on its horizontal axis. The susceptibility of the apparatus is so great that the small change on the pressure that B produces on A in turning the apparatus is sufficient to regulate the contact.—*Deutsche Industrie Zeitung.*

A Gopher Trap Wanted.

The California ground squirrel, commonly known as the gopher, is a most industrious and audacious forager, and though he seems very innocent, is a veritable pest. He consumes an inordinate quantity of grain, and does a vast amount of mischief to gardens and orchards. He and high farming are declared to be absolutely incompatible, and the Golden State is greatly concerned as to the best manner of exterminating him. Poison has been tried, and has proved effective on many squirrels; but they are so cunning that they refuse to swallow it after one season, unless it be offered in a new form. Strychnine, arsenic, and phosphorus have been tried, and now other mortal agents must be adopted to get rid of the aggressive rodents. It is estimated that their damage to the wheat crop alone was last season nearly $1,000,000, and to gardens and orchards fully $500,000 more.

Here would seem to be a good chance for some clever inventor to make a good thing for himself and a better for the State. A wide-awake California boy, after proper study of "gopher" habits, ought to be able to outwit the little pests. A successful gopher trap would be worth a small gold mine.

Destruction of Passaic Fish.

For some weeks a fatal disease has prevailed among the fish of the Passaic river (N. J.) and its tributaries. The trouble was at once charged to poisonous dyes discharged into the stream from silk-factories. The fish warden of Passaic county is of a different opinion, attributing the fatality to certain poisonous vegetable matter which had grown with unusual luxuriance during the late heated spell. This happened at an unusual season, just after the fish had been spawning, and when they had not strength to withstand the injurious effect of the water. The disease is described as a fungous growth on the surface of the fish, beginning at the tail and causing the scales to decay and become loose. In eight or ten days the trouble reached the head, and the fish died. Suckers were first attacked, then catfish, roach, chub, sunfish, perch, and pickerel. Persons eating the fish were attacked with cramps and purging. Fish Warden Roe does not think the sewage has anything to do with the disease. The epidemic is about over in the Passaic River, but is extending to the tributary streams and lakes.

HYDRIODIC ACID.

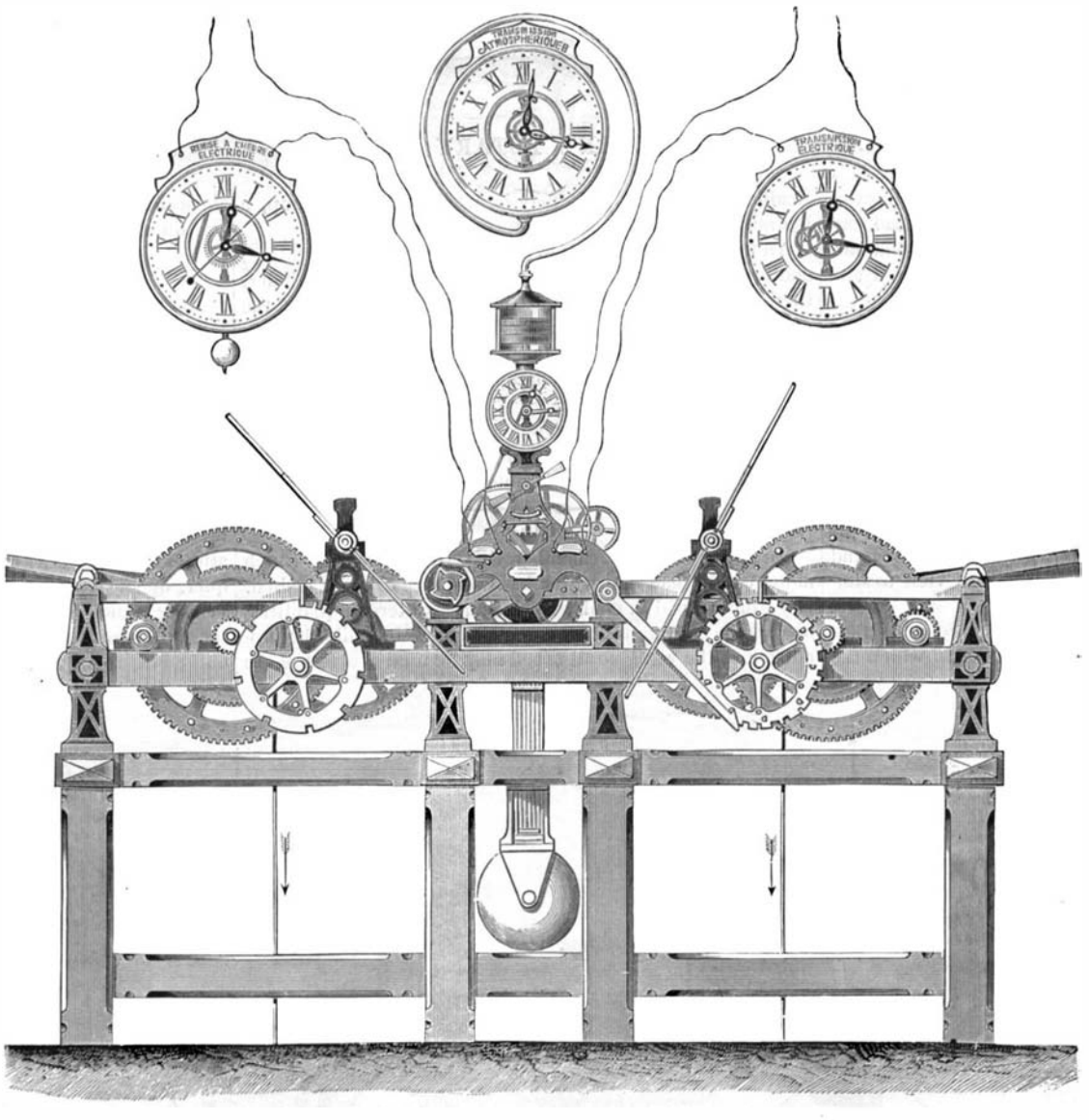
Dr. W. Gill Wylie, of this city, calls attention in the *Medical Record* to the value of hydriodic acid as a therapeutic agent in certain cases where the use of potassium iodide is indicated, but where the continued use of the latter would irritate the stomach and seriously interfere with digestion. Hydriodic acid, which is not even mentioned in the text books on therapeutics, is prepared by mixing say 60 grains of potassium iodide with 90 grains of tartaric acid, dissolving in water, and adding sufficient heavy sirup to make four fluid ounces. The object of the sirup is to prevent a decomposition whereby the iodine would be set free. The case that first suggested this remedy was one of asthma of long standing. On trial it was found that one teaspoonful of the above mixture had as much influence on the bronchial surfaces as twenty grains of potassium iodide, and produced no bad effect whatever on the stomach. The author states that for the past six years he has had uniformly good results in the use of hydriodic acid in bronchitis, and in chronic or subacute catarrhal diseases. He has found that it acts as an irritant and does more harm than good, however, in acute febrile stages. He has also used it in chronic malarial poisoning, and in Grave's disease, and recommends its use in place of iodine in goiter and adipose tumors. In a case of the latter he found that it relieved the dull pain about the tumor and slightly reduced the bodily weight of the patient, who was very fleshy. In the use of the new remedy Dr. Wylie says that he has seldom found it necessary to increase the usual dose to obtain the desired effect.

PNEUMATIC CLOCK.

The pneumatic clocks that were exhibited in the Austrian and American sections of the Paris Universal Exhibition of 1878, were described by us not long since. We give herewith an engraving, which we take from *La Nature*, of a form of pneumatic clock that has been in use for some time in France. It is a large town clock, something like the one which has been in use at Notre Dame since 1867.

The transmission of time by the compressed air and vacuum is effected by means of a piston that moves freely in a pump barrel. The piston is of considerable length and is air-packed, so that little or no air escapes around it.

Every minute, or every half minute, the clock elevates the piston, creating an air pressure in the pneumatic tube, which operates the hands of a distant clock. The piston is allowed to descend after each upward stroke, producing a vacuum, which returns the parts to their original position preparatory to another forward movement of the hands as the piston again descends.



COLLEN'S PNEUMATIC CLOCK.

Active Volcanoes in Java.

The latest accounts from Singapore state that the volcanoes in both the eastern and western districts of Java are in full activity. A broad river of fiery lava was flowing from the crater of Smeru down to the southern coast, illuminating all the neighborhood at night with its ruddy light. The Gedeh mountain was ejecting an enormous amount of cinders, which were completely covering all the surrounding district.

A Toy City.

A notable example of patient, long-continued, ingenious, but utterly useless labor, is described by a correspondent of the Amherst (Mass.) *Transcript* as on exhibition in Boston. It is the work of a German-American cabinetmaker, Joseph Bergmann, who has been engaged upon it for seventeen years. It represents a city, built in the Swiss style, with mansard roofs, bay windows, and a series of balconies with verandas, etc. The structure stands on a base, representing a hillside, a ledge of rocks with underground railways, etc. There are sixty-five automatic workmen, at work in the mills and about the village, as natural as life. The motive power of the mills is furnished by two overshot water wheels, the lower one taking the waste water and running at right angles with the upper one. The remainder of the machinery, as well as the automatic workmen, is run by weights. The city, or village, is surrounded by trees and shrubbery, drives and walks, a playing fountain, a running stream, a miniature lake, and all that goes to make up the picturesque in nature. The basement of the principal building is occupied by a linseed oil stamp mill in full operation, with three workmen. On either side is a tunnel through which trains of cars pass. At the rear of the building is a blacksmith's shop; the bellows are blowing, the fire on the forge glows, and two blacksmiths are busily engaged in alternately heating a bar of iron and pounding it on the anvil, the strokes of their hammers being distinctly audible. A third is shoeing a horse, the proprietor is at work, and the wife of the last is just entering, bearing her husband's dinner. The third story is occupied by a grist mill, the smut mill being below, both in full operation. One man is dressing the stone for the hopper, while a second supplies the hopper with grain from a neighboring room; the latter empties his measure from his shoulder, returns it in a natural manner, and passes in and out at the door, closing it after him each time. An elevator ascends on the outside from the basement with a load of grain, dumps it, and descends again to be refilled. Just below the elevator the millwright goes up and down on a ladder. Under an oak tree's kindly shade, near the banks of a murmuring stream, sit two lovers, who, by their motions and gestures, would appear to be carrying on an animated conversation. To the right center of the building is a sawmill. The log is propelled on the carriage, the upright saw passes through it slowly, it is then gigged back, the man at the end sets the log for a new cut, and a fellow workman opens the flume gate, restarting the machinery. A third man is engaged sharpening a handspike with an ax. The fifth and top floor of the edifice is supposed to be the residence of the proprietor. The windows are sashed, the doors paneled, and the floor made of matched boards not over an eighth of an inch wide. Paintings, with gilt frames, and lace curtains adorn the apartment, which is complete in all the details belonging to a drawing room. A similar exhibition in Brooklyn recently gave no evidence of the skillful labor attributed to Bergmann's work, as described above. Whether it was the same or not, we do not know.

Anthracite Coal in Mexico.

According to the San Francisco *Mining and Scientific Press* Sonora possesses a vast field of anthracite coal—the only anthracite yet discovered on the Pacific coast. It is said to belong to a very old geological formation, probably Silurian or Devonian. The only outcrop which is at present worked lies about 120 miles northeast of Guaymas, and a branch line of the Sonora railway is contemplated to develop it. The mine is a few miles north of the flourishing mining towns of La Barranca and Los Bronces, each supporting some 2,000 inhabitants. The coal has been used for two years for steam purposes at the Barranca quartz mill, it containing less ash and leaving no clinkers on the grate. It burns with the short blue flame of carbonic oxide, which is characteristic of all anthracite coal. There are three veins of the coal, one of which is seven feet thick, another two and one half feet, and the third of unknown thickness, while there are indications of a seam lying beneath the seven foot vein—the one now worked—of the same or greater thickness. Outcroppings of the veins are traced for many miles. The analysis of this coal as compared with the average grade of Pennsylvania anthracite is as follows:

	Sonora Coal.	Pennsylvania Coal.
Fixed carbon	94 to 96 per ct.	85 per ct.(about).
Ash	3 to 4 do.	10 do.
Moisture	1 to 2 do.	4 to 5 do.
Sulphur	0·0 do.	a trace.
Bitumen	0·0 do.	a trace.
Specific gravity	1·77	1·50

The dip of the discovery is 26° toward the opening, rendering the mine easy of drainage and cheaply worked. The length of the branch from the main line at Noria del Valle (32 miles from Guaymas) necessary to reach the mine is 98 miles. It is estimated that after the construction of the road the coal may be marketed in San Francisco and South American ports at $8 to $9 per ton.

Medical Photography.

At a recent meeting of the Photo Section of the American Institute, in this city, Mr. Mason exhibited to the Section some photographs of subjects taken at his studio in Bellevue Hospital. In his remarks he said:

I do not exhibit these prints as specimens of fine photographic work, but as curiosities of disease and how photography is used to illustrate disease. Some of them show the patient both before and after treatment. Such subjects are not very easy to keep still a long time, because most of them are in pain. Something more than ten years ago I was requested by several members of the surgical staff to illustrate the diseases treated at the hospital, and, after considering the matter some months, finally accepted the proposition, and was appointed the official photographer for the department. There were at that time only three surgeons on the staff who seemed to have an idea that photography could be made useful, or, rather, that it might prove an important adjunct to their work. These three had their most important cases photographed when they were received, and after an operation or when they were discharged. After two or three years other members of the staff, seeing the importance of the work, slowly came in for their share, until at the present day the men who first took little or no interest in the introduction of photography patronize it the most extensively. I made for some of these surgeons a large number of prints of important cases, of which some are sent to Europe to illustrate the processes used in the treatment of diseases in New York. I make three copies, which I furnish free—one to the visiting surgeon in attendance, another to the house surgeon who has charge of the case, and another print I mount in the books of the hospital. Other prints are made on the surgeons' private orders at little more than cost price. When you refer to the hospital books provided for the last few years, you can find the most important surgical cases not only fully described but illustrated. Many observers have thus been able to avoid mistakes and errors which have been brought to their notice through the means of photography. Thus we see that the surgeons and histologists, like most other scientific men, are more or less dependent on photography in recording for others what they are doing.

Unshod Horses.

It has been before stated that an experienced farrier in England was advocating the abolishment of horseshoeing, and now a writer in the London *Times* has been trying the experiment, and thus reports: "When my pony's shoes were worn out I had them removed, and gave him a month's rest at grass, with an occasional drive of a mile or two on the high-road while his hoofs were hardening. The result at first seemed doubtful. The hoof was a thin shell, and kept chipping away until it had worked down beyond the holes of the nails by which the shoes had been fastened. After this the hoof grew thick and hard, quite unlike what it had been be-

fore. I now put the pony to full work, and he stands it well He is more sure-footed; his tread is almost noiseless; his hoofs are in no danger from the rough hand of the farrier; and the change altogether has been a clear gain, without anything to set against it My pony, I may add, was between four and five years old—rising four, I fancy, is the correct phrase. He had been regularly shod up to the present year"

RECENT MECHANICAL INVENTIONS.

An improved hand stamp for canceling postage stamps, and printing, dating, and marking generally, has been patented by Mr. Wm. J. Blackwell, of Waynesborough, Va. The press has a cam shaft which moves the stamping devices, and a sliding plate, in such a way that when the plate is moved back to uncover the ink pads the canceling stamps are forced down upon the pads.

An improved brake for wagons has been patented by Mr. William de Ray, of Murray, Ky. It is constructed so that it will be applied by the team in holding back, and will be taken off as the team draws forward. It is provided with means for locking it in either position.

Mr John H. Jenner, of Leavenworth, Ind., has patented an improved brake lever for wagons. It consists of two levers, the principal one fulcrumed to the wagon body or frame, and the other pivoted to it and connected with the brake rod. The slack motion is taken up by the second lever, and the brake is applied by the principal lever.

An improvement in magazine firearms has been patented by Mr. Peder Bergersan, of Cheyenne, Wyoming Ter. The breech mechanism is opened and closed by means of a lever hung on a pin that passes through ears projecting from the underside of the trigger plate. The firing bolt or hammer is straight and is operated by a spiral spring. The gun may be used as a magazine gun or as a single breech loading rifle.

An improved machine for flinching, grooving, and beveling barrel staves when set up in barrel form, has been patented by Mr. Thomas McKeever, of Pittsburg, Pa. It consists in a hollow cutter head carrying the grooving and crozing knives, and in peculiar mechanism for holding the barrel while being grooved and crozed.

Mr. C. Sullivan, of Three Rivers, Mass., has patented an improved spooling guide, which consists of a flanged and slotted head in which is a slotted plate held in a horizontal position by set screws. From this plate rises the guide, which is composed of two crescent shaped arms turned in opposite directions; with this device the yarn can be fed very evenly.

Mr. Wilson N. Fort, of Lewisville, Ark., has patented an improved rotary engine, which consists in a peculiar arrangement of a double rock valve, and hollow inlet and outlet valves, the whole being arranged with a view to simplicity and durability.

Messrs. John E. Duncan and Alanson B. Alden, of Boscobel, Wis., have patented a permutation lock, in which the combination is set by the act of locking, and in unlocking the parts are readjusted, so that the combination is not set while the lock is unlocked.

An improved hair trigger for firearms, which is complete in itself and may be applied to any kind of firearm without change in its construction, has been patented by Mr. Emil A. F. Toepperwein, of Boerne, Texas.

Messrs. N. B. Gunn and A. D. Mendenhall, of Elwood, Ind., have patented an improved apple corer and cutter, in which the tube and its radial knives are detachably secured to the slotted sliding board, so that the machine may be readily taken apart for cleaning,

An improvement in gun locks, patented by Mr. Thomas Duncan, of West New Annan, Nova Scotia, consists in a stop pivoted under the end of the mainspring close to the swivel and controlled by the trigger and a spring.

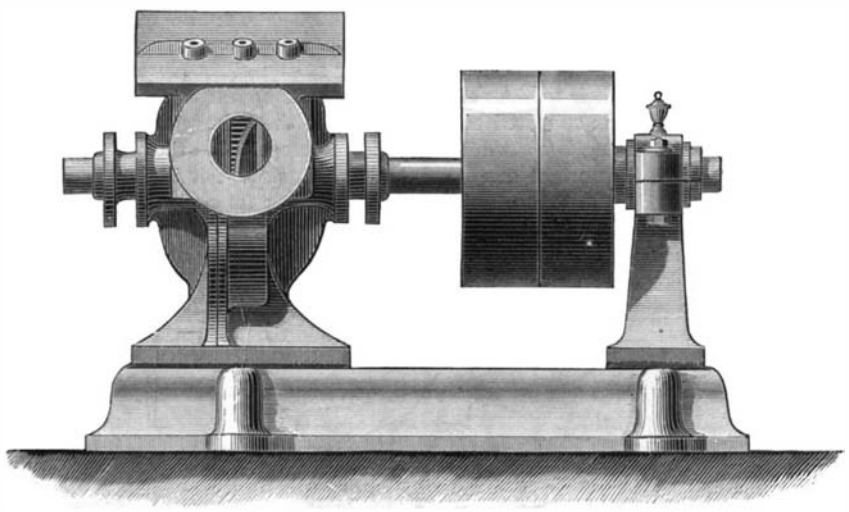
Mr. F. H. Purenton, of Brunswick, Me., has invented an improved sectional steam boiler, having a lower section or water chamber surrounding the fire chamber, and connected with an upper section by means of inclined pipes, the said upper section being provided with curved flues that communicate with the smoke stack.

Spontaneous Combustion.

The St. Louis *Republican* gives this account of the origin of a recent mysterious fire in that city: A well authenticated case of spontaneous combustion occurred recently in the suburbs of Oak Hill, the residence of Mr. Edward Mead, the jeweler, furnishing the sensation. The circumstances of the fire were, fortunately, such as to leave no doubt regarding its cause, and these circumstances are especially interesting in a city where fires of a mysterious origin have been remarkably frequent. The fire proved to be the result of spontaneous combustion, and from a cause which has been the one usually credited with effects of the kind. Some of the floors in Mr. Mead's house had lately received a thorough coating of colored varnish, and, in the polishing, hemp cloths (squares cut from sacks) had been used. One of these sacks, saturated with the varnish, had been put in the basket for further use. It had of itself smoldered, and finally produced the fire. The case is a curious one, and of value from the knowledge it affords of a dangerous combination.

A NOVEL ROTARY PUMP.

Ortman's rotary pump, which is shown in the accompanying engravings, is made by Messrs. Van Goethen & Reallier, of Brussels. It may be used either as a pump, a hydraulic motor, or an air compressor.



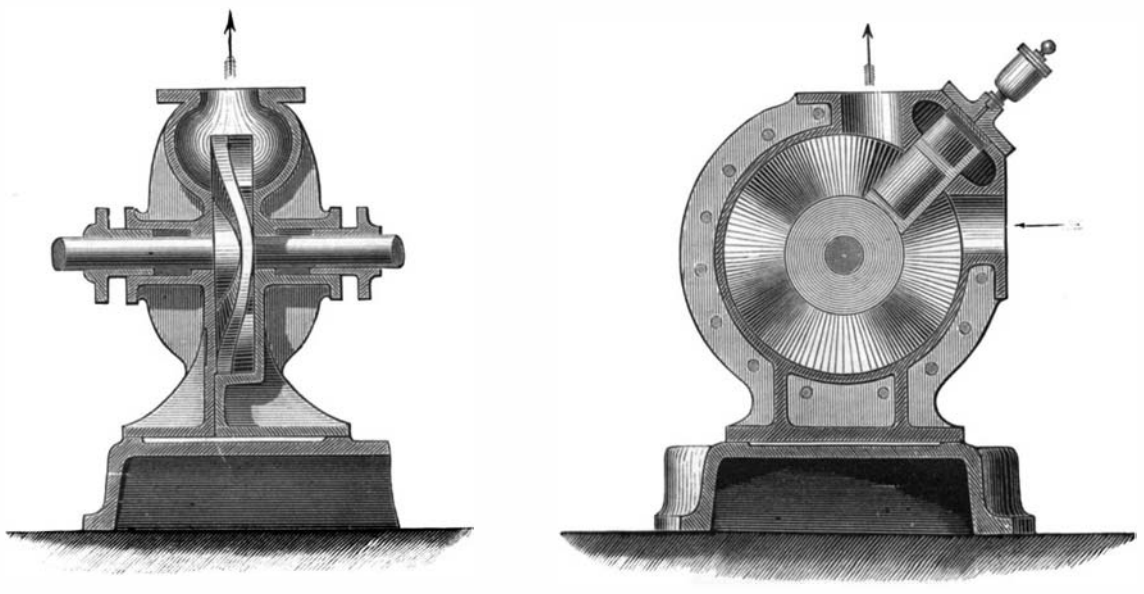
ORTMAN'S ROTARY PUMP.

An undulated disk is fitted accurately to the pump casing, and in a transverse chamber, which intersects the cylinder, there is a slide, which is slotted to receive the edge of the undulated disk. At opposite sides of the slide there are openings in the casing for the ingress and egress of water. The slide acts as the abutment, and the undulated disk as the piston.

A pump of this kind, having a 39 inch disk, will deliver nearly 18 gallons per revolution and may be driven at the rate of 150 revolutions per minute.—*Cronique Industrielle.*

Glue.

Carpenters should remember that fresh glue dries much more readily than that which has been once or twice melted. Dry glue steeped in cold water absorbs different quantities of water according to the quality of the glue, while the proportion of the water so absorbed may be used as a test of the quality of the glue. From careful experiments with dry glue immersed for twenty-four hours in water at 60° Fah., and thereby transformed into a jelly, it was found that the finest ordinary glue, or that made from white bones, absorbs twelve times its weight of water in twenty-four hours; from dark bones, the glue absorbs nine times its weight of water; while the ordinary glue, made from animal refuse, absorbs but three to five times its weight of water.—*Building News.*



ORTMAN'S ROTARY PUMP.—VERTICAL SECTIONS.

Carriage Pigeons.

The carrier-pigeon service is now in full operation in France. The number of birds fed by the government is 6,000. These pigeons are located in Paris and twelve other large fortified towns. A number of soldiers and officers have been taught the art of pigeon breeding, and carriers are constantly sent from place to place. The Minister of Public Instruction and the Minister of Agriculture have established prizes for pigeon races.

Splitting Paper.

It is one of the most remarkable properties of that wonderful product, paper, that it can be split into two or even three parts, however thin the sheet. We have seen a leaf of the *Illustrated News* thus divided into three parts, or three thin leaves. One consisted of the surface on which the engravings are printed; another was the side containing the letter press, and a perfectly blank piece on each side was the paper that lay between. Many people who have not seen this done might think it impossible; yet it is not only possible, but extremely easy, as we shall show.

Get a piece of plate glass and place on it a sheet of paper; then let the latter be thoroughly soaked. With care and a little dexterity the sheet can be split by the top surface being removed. But the best plan is to paste a piece of cloth or strong paper to each side of the sheet to be split. When dry, violently and without hesitation pull the two pieces asunder, when part of the sheet will be found to have adhered to one and part to the other. Soften the paste in water and the pieces can be easily removed from the cloth.

The process is generally demonstrated as a matter of curiosity, yet it can be utilized in various ways. If we want to paste in a scrap-book a newspaper article printed on both sides of the paper, and possess only one copy, it is very convenient to know how to detach the one side from the other. The paper, when split, as may be imagined, is more transparent than it was before being subjected to the operation, and the printing ink is somewhat duller; otherwise the two pieces present the appearance of the original if again brought together.

Some time ago the information of how to do this splitting was advertised to be sold for a considerable sum. We now impart it to all our readers gratuitously.—*B. and O. Printer and Stationer.*

Sir Henry Bessemer.

Mr. Henry Bessemer, of Denmark-hill, Camberwell, on whom her Majesty has been graciously pleased to confer the honor of knighthood, in recognition of his services in the manufacture of malleable iron and steel, and in numerous other inventions, is a son of the late Mr. Anthony Bessemer, of Old Broad street, London, and subsequently of Charlton, Hertfordshire, where he was born on the 19th of January, 1813. He was, to a very great extent, self-taught, and at twenty years of age exhibited a design at the Royal Academy, then located at Somerset House. He first attracted the attention of Lord Althorp, then Chancellor of the Exchequer, by an ingenious contrivance which he made for preventing frauds which were carried on upon a large scale by the transference of stamps from old documents to new ones; but, though the saving to the public purse was estimated at nearly £400,000 a year, he never received any remuneration for his ingenuity. In 1856 he read before the British Association, at Cheltenham, his first paper on the manufacture of malleable iron and steel, which has given him a world-wide name—literally so, for the Americans have christened after him a thriving new town on the Cincinnati Railway, and "Bessemer metal" has become current in most of the languages of civilized communities. Mr. Bessemer's great inventions have been recognized both at home and abroad, for the Emperor of Austria conferred on him the rank of a Knight Commander of the Order of Francis Joseph, and the late Emperor of the French offered to his acceptance the Grand Cross of the Legion of Honor, in consequence of a report from the jurors of the Universal Exhibition of 1867 that his invention was of exceptional merit. He has also been the recipient of the Albert Gold Medal, presented to him by the hand of the Prince of Wales. It is stated by Blanch, in his "History of Camberwell," that in the course of his various experiments, Mr. Bessemer has taken out more than one hundred patents, and has paid to the Crown as much as £10,000 for stamps alone.

A PLAGUE of locusts fell upon the province of Caucasus, Russia, during April. Vineyards and fruit gardens were utterly destroyed. The water courses were choked by the swarming pests, and the village streets were so blocked by them that the shops were shut and all traffic suspended.

Self-Defense among Plants.

One of the means of self-defense among plants, says Dr. Francis Darwin, in a recent lecture, is the presence of poisonous alkaloids. Thus ruminants will not eat such plants as nightshade (*belladonna*); monkshood (*aconite*), hellebore, thorn apple (*stramonium*), pæony, veratrum, and hemlock (*conium*). Many plants are protected by their poisonous milky juices, as the spurges (*euphorbiæ*), poppy, celandine, and others. In the *strychnos nux vomica*, the poisonous alkaloid strychnia is contained in the seeds, its whole object being to prevent them and the young plants contained in them from being injured, the fleshy parts of the fruit being quite harmless and eaten by the natives. This eatable part surrounding the seeds entices birds to swallow them, that they may be distributed after and by passing through the animals' bodies. Bitter almonds are comparatively safe from the attacks of mice, whereas sweet almonds are much injured by them. In addition to an almost endless series of poisonous plants, there are those which contain essential oils having a pungent aromatic odor or taste. Thus the fennel, anise, caraway, and others have otherwise unprotected seeds, which are safe from the attack of birds on this account. In Brazil the lime alone of all the orange tribe is distasteful to the leaf-cutting ants, probably owing to an oil similar to that which gives the strong taste and odor to orange peel; and this fact has decided the fate of the tree, for it is the only species of the tribe which has been able to establish itself beyond the limit of cultivation, the orange, citron, etc., growing only where protected by man. Turpentine in fir leaves serves as a protection against cattle. The aromatic flavor of mint is a defense against browsing animals, and as it is frequented by a large number of insects it affords an analogy to the nettles and thorns, which are resorted to by butterflies and birds to rear their young. Flowers are usually more acrid than the plants which bear them, and are thus protected from destruction by browsing animals and other foes, by being uneatable. Caterpillars will die of hunger rather than eat the flowers of the plants whose leaves form their natural food.

Crickets Stop a Train.

One cricket would stand a poor show trying to stop a railroad train, but millions of them can do it. The western bound railroad train, No. 6, met an army of crickets at Clarke's Station, about 15 miles west of Reno, says the *Gazette*, and was detained two hours and a half trying to get through. To make the passage the train men were finally forced to take brooms and sweep the insects off the rails. The crickets covered the track for about three miles, and when the driving wheels of the engine would strike them they would whirl around without going forward an inch.

THE ELEPHANT SHREW.

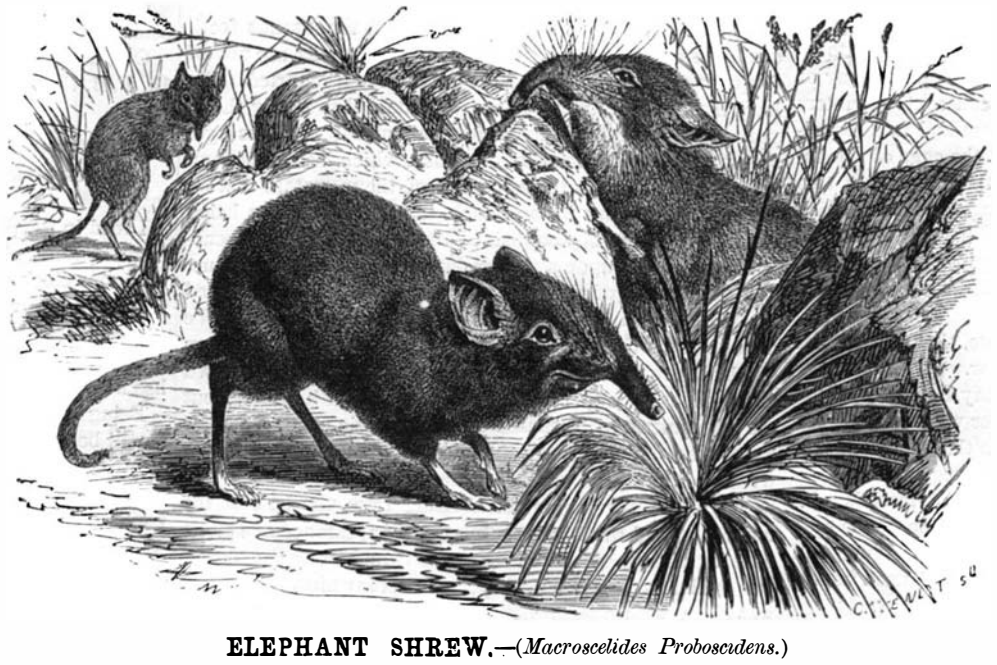
Several species of elephant shrews are known to exist, all of which, with one exception, are inhabitants of Southern Africa. The solitary exception, *Macroscelides Roretti*, is found in Algeria.

The peculiarly long nose of the elephant shrew is perforated at its extremity by the nostrils, which are rather obliquely placed, and is supposed to aid the animal in its search after the insects and other creatures on which it feeds. The eyes are rather large in proportion to the size of the animal.

The tail is long and slender, much resembling the same organ in the common mouse, and in some specimens, probably males, is furnished at the base with glandular follicles, or little sacs. The legs are nearly of equal size, but the hinder limbs are much longer than the fore legs, on account of the very great length of the feet, which are capable of affording support to the creature as it sits in an upright position. As might be presumed from the great length of the hinder limbs, the elephant shrew is possessed of great locomotive powers, and when alarmed can skim over the ground with such celerity that its form becomes quite obscured by the rapidity of its movement through the air. Its food consists of insects, which it captures in open day.

Although the elephant shrew is a diurnal animal, seeking its prey in broad daylight, its habitation is made below the surface of the ground, and consists of a deep and tortuous burrow, the entrance to which is a perpendicularly sunk shaft of some little depth. To this place of refuge the creature always flies when alarmed, and as it is so exceedingly swift in its movements, it is not readily captured or intercepted.

The color of the fur is a dark and rather cloudy brown, which is warmed with a reddish tinge upon the sides and flanks, and fades on the abdomen and inner portions of the limbs into a grayish-white. The generic name, Macroscelides, is of Greek origin, in allusion to the great length of its hinder limbs, and signifies "long legged." It is but a small animal, as the length of the head and body is not quite four inches in measurement, and the tail is about three inches and a quarter.



ELEPHANT SHREW.—(*Macroscelides Proboscidens.*)

The colors of the adult are quite variable, and are generally obliterated in cabinet specimens; shades of gray, brown, and greenish brown predominate, the head of the male being pale and having three longitudinal fuscous stripes, and the middle thighs having annulate shades of the same color. The front legs of the male and the shanks of the others are almost always green. The colors of the female are more uniform, generally grayish, with paler specks and moultings on the head and along the back; but occasionally pale green predominates. Structurally the male is at once distinguished by his shorter, more slender body; his longer legs and feelers; his narrower and less dilated front thighs; his swollen middle thighs, and by the greater stoutness of the spines near the ends of the middle and hind thighs, these and the other distinguishing sexual characters being less obvious in the earlier stages of growth.

THE THICK-THIGHED WALKING STICK.

BY PROF. C. V. RILEY.

During the past few years the forests in parts of New York have been very seriously injured by the insect herewith treated of, and which has hitherto been considered quite harmless by writers on entomology. An account of it will appear in my forthcoming report to the Department of Agriculture, from which I condense some facts in advance.

Owing to its curious, slender, long-legged, slow-moving characteristics it has been popularly dubbed the "Walking Stick," "Stick Bug," "Specter," while in some localities it is known as "Prairie Alligator," "Devil Horse," and other odd cognomens, generally indicative of its appearance, and of a superstition which is quite prevalent, but most unfounded, that it is poisonous and can sting or bite.

The popular name above employed will serve to distinguish it from another tolerably common species, the two-striped walking stick (*Anisomorpha buprestoides*, Stoll).

THE THICK-THIGHED WALKING STICK.—(*Diapheromera femorata*, Say.)

a, eggs, vetral view; *b*, do., side view, enlarged; *c*, do., in various positions, showing young hatching; *d*, *d*, male, back and side views; *e*, female, side view—natural size (after Riley).

As already stated, this insect has until within a few years always been considered harmless. In 1872, however, while lecturing at Cornell University, I noticed that it was unusually abundant around Ithaca, and it was there reported as doing considerable injury to rose bushes; and the following letters from correspondents will show how very destructive the species may become:

"Inclosed find specimens, male and female, of an insect which is proving to be a scourge. About the middle of June I discovered, mostly on standing grass, this same insect, only very much smaller, of a light pea-green color, but not in sufficient numbers to be thought of as a pest. I noticed about August 15th, in the reservation of young timber, mostly white oak and hickory, a few trees having the appearance of being burned just enough to kill the leaves. On closer investigation I found many of these insects devouring the leaves. Later I judged at least 25 acres were completely stripped of foliage, as much so as if fire had run through the wood and killed every tree. They seemed to have no choice as to what variety of timber they attacked. There were many in my peach orchard and lawn. On single trees far removed from my timber lot they were as thick as could well be, in many places in heaps. Fences adjoining the timber were fairly covered with them. They have been known for years in this vicinity, but were heretofore always considered harmless. From present appearances they are greatly to be feared as a scourge, consequently anything relating to them will be read with great interest. I hear from them in Florida, but not in such numbers as here."—G. C. Snow, Yates Co., N. Y., in New York *Weekly Tribune*, Nov. 11, 1874.

"About forty years ago my father set out a grove of locust trees for fencing purposes at the foot of a rocky wooded hill. The trees throve, and for years have furnished the farm with posts and stakes. When they were young we began to notice on them, now and then, the insects known as 'Walking Sticks,' and some fifteen years ago they began to increase rapidly, appearing in summer on the locusts, to which at first they seemed to confine themselves, entirely stripping them of their leaves, and have done so every second year since.

"The locusts have nearly all succumbed to the repeated attacks of the repulsive looking pests, which have for some time extended their operations to the adjoining native trees, most kinds of which they feed upon ravenously.

"I have never by observation been able to discover when or where the eggs are deposited, nor can I find more than a description of the insect in any book within my reach. Will you throw a little light on the subject, and can you suggest any method of destroying these pestiferous walking sticks?"—R. E. R., Ferresburg, Vt., in *Rural New Yorker*, November 7, 1874.

"In June last we gave an account of a remarkable visitation of myriads of the insect known as the walking stick (*Spectrum fermoratum*) in Yates County, N. Y., and asked for information as to the appearance elsewhere. The following, from Mr. E. H. Conklin, Cumberland County, Pa., is the first response, which we hope may call out others. Mr. C. says: 'This insect, though not at all common and seldom numerous, has made its annual appearance in our peach orchards for forty years, and only once in this time have they been so numerous as to be injurious. In this instance, which was about ten years ago, these insects denuded a row of locust trees that formed a shelter on the northwest side of a peach orchard. For half a dozen rods from this locust row the peach trees were also stripped of their leaves. Previous to this time we never saw them on any other tree except the peach. As to color, some are light green and others brown, amongst male and female. The female has a much heavier body than the male.'"—*American Agriculturist*, August, 1877.

A further account of great injury to oak timber by this insect on Mr. Snow's farm was given in the *American Agriculturist* for June, 1877, and when applications were made through the editor of said journal for more definite information and for some practical recommendation, so little was any one able to comply with such a request, I deemed the matter of sufficient interest and importance to warrant further investigation. A couple of visits to Esperange farm enabled me to clear up the insect's natural history, and suggested, as the sequel will show, a simple and feasible means of preventing its injuries. Mr. Snow has about 50 acres of woodland, consisting of fine young trees, mostly the second growth of hickory and of different species of oak. In 1874 the trees on about 25 acres were totally defoliated. In 1875 the insects appeared in fewer numbers. In 1876 they were even more numerous than in 1874, and covered a large area. In 1877 again they attracted less attention, while last summer I found that Mr. Snow's accounts were by no means exaggerated. By the middle of August the bulk of the pests were going through their last moult, and by the end of autumn they had stripped most of the trees, showing, however, a decided preference for the black, red, and rock chestnut oaks, to the white oaks and hickories, which they affect but little till after the first mentioned trees are stripped. The underbrush was also very effectually cleaned of its foliage, and the insects hung from and clung to the bare twigs and branches in great clusters. They settle freely to roost on the witch-hazel, but do not defoliate it until the other trees mentioned are pretty bare. Sumac and thorn are also little affected, while peach and apple, in an adjoining orchard, were untouched. Whenever they have entirely stripped the trees and shrubs they move in bodies to fresh pastures, crowding upon one another and covering the ground, the fence rails, and everything about them, so that it is impossible for a person to enter the woods without being covered by them. The timber affected can be recognized by its seared and leafless appearance from a great distance, and upon entering the woods the ear is greeted by a peculiar

seething noise, resulting from the motion of the innumerable jaws at work on the leaves. Their depredations first begin to attract attention soon after wheat harvest, and are most noticeable in September. The injury to the trees done in 1874 and 1876 was manifest in the death of most of the black oaks, and, according to Mr. Snow's observations, trees die in three years after the first attack.

The unexampled multiplication and destructiveness of this insect at Esperange farm is but one of the many illustrations of the fact long since patent to all close students of economic entomology, that species normally harmless may suddenly become very injurious.

The winter habits of the species have not before been published. The eggs, which were first briefly described by me in 1874,* are 2·8 mm. long, oval in shape, slightly compressed at the sides, and of a polished black color, with a ventral whitish stripe. They look not unlike some plump diminutive leguminose seed. They are simply dropped loosely upon the ground from whatever height the females may happen to be, and, during the latter part of autumn, when the insects are common, one hears a constant pattering, not unlike drops of rain, that results from the abundant dropping of these eggs, which in places lie so thick among and under the dead leaves that they may be scraped up in great quantities.

From general observation of specimens kept in confinement it would appear that each female is capable of laying upward of a hundred. The eggs remain on the ground all through the winter, and hatch for the most part during the month of May. Some of them, however, continue hatching much later, so that all through the summer, and even into the fall, young individuals appear. The young walking sticks measure at birth 4·5 mm., and with their feelers and legs outstretched nearly double that length. They are invariably, during early life, of a uniform pale yellowish green color, and as they have a habit in their earlier days of keeping near the ground, this, coupled with a great readiness to drop whenever disturbed, serves to protect them from observation. They may for these reasons occur in great numbers in the early part of the season without being suspected. The exact number of moults that the insect passes through has not been carefully studied, but it changes very little in appearance from birth to maturity, except so far as color is concerned. With age the green color gives way to various shades of gray and brown. In this way we find great correspondence with its surroundings. While the vegetation is green the specters are green also. When the foliage turns in autumn they change color correspondingly, and when the foliage is stripped they so closely resemble, in both appearance and color, the twigs upon which they rest—the habit of stretching out the front legs and feelers greatly enhancing the resemblance—that when they are few in numbers it is difficult to recognize them. A few green specimens, more particularly of the males, may always be found, even among the mature individuals.

In contemplating these singular creatures and their wonderful resemblances to the oak vegetation upon which they occur, one cannot help noticing still further resemblances. They are born with the bursting of the buds in the spring; they drop their eggs as the trees drop their seeds, and they commence to fall and perish with the leaves, the later ones persisting, like the last leaves, till the frost cuts them off.

As will have been already noticed, Mr. Snow has found from his own observations that the insects were injuriously abundant every other year, and I have been interested in endeavoring to find an explanation of this fact. The increase of the insect's natural enemies whenever they become excessively abundant, and the consequent decrease of the plant feeder the following year, undoubtedly have something to do with it; but there is also good evidence that a great many of the eggs remain on the ground for two consecutive winters before hatching. Messrs. T. W. Bringham and L. Trouvellot have both found from experience that the eggs of this insect for the most part hatch only after the interval of two years,† and an examination made of a large number which I have myself kept the present winter shows that while some have proceeded far into embryonic development, others show no development whatever, thus corroborating the experience of these gentlemen.

We may very justly conclude, therefore, that the species will only be injurious every alternate year.

While the specters are young they may be destroyed by sprinkling the underbrush in the timber with Paris green water whenever the timber is inclosed, so that domestic animals can be kept away from the poisoned vegetation.

The most satisfactory means of averting the insect's injuries, however, will be found in the destruction of the eggs during winter. This may be done either by digging and turning them under, or by burning over the dead leaves among which they lie.

Ichneumon Flies.

It is an interesting fact that not a single ichneumon fly is known to attack our locust, nor has one ever been found to attack any of the different locusts or grasshoppers that occur in the country. We have sought diligently for evidence of the occurrence in locusts of any of these essentially parasitic insects. By ichneumon flies we intend not those of the genus *Ichneumon* alone, but any belonging to the great family *Ichneumonidæ*. They are known to attack plant-feeding species of all orders except the half winged bugs (*Heteroptera*) nd the straight winged insects (*Orthoptera*), to which last the locust belongs. Westwood, St. Fargeau, Brullé, and other authors who have paid especial attention to these ichneumon flies, all concur in excepting the orthoptera from their attacks.

Von Motschulsky speaks of having found a species (*Proctotrupes brevipennis*, Latr.) of an allied family near Italian locusts, and infers, without proof whatever, its possible parasitism thereon; but of the latest and most reliable European authorities—Gerstaecker and Köppen—the former states explicitly that no ichneumon is known to attack the European locust; while the latter knows of none, and refers only to rumors of the occurrence of bee-like insects that sting the locust, and which rumors doubtless have reference to digger-wasps or tachina flies. Again, Mr. Thomas Bath,* in treating of the injuries of locusts in Australia, one species of which (given as *Ordipoda musica*, Fabr.) in size and general appearance is not unlike our *Spretus*, figures an ichneumon fly (given as *Bracon capitata*) stinging a locust, and certain maggots, supposed to be the larvæ of the same, taken from a locust. But the former is imaginary, unreal, and evidently not from actual observation, while the latter are the larvæ not of an ichneumon, but of some dipterous (doubtless *Tachina*) fly.

Coming to our own country: Mr. Brous, in 1876, sent us two ichneumons—a *Campoplex* and *Ephialtes notanda*, Cresson—noticed flying about locusts, but without evidence of their stinging these; and Prof. Aughey has sent us a female *Lampronota brunnea*, Cresson, which he believes to have bred from winged specimens of *Spretus* in August, 1874. But his notes lack in absolute certainty, and he himself, on that account, refrained from referring to the supposed fact; while the long ovipositor and well known habit of some species of the genus of preying on wood boring coleopterous larvæ, to reach which the ovipositor is admirably adapted, strengthen the uncertainty and render further corroborative evidence necessary before we can say that any ichneumon fly actually preys on the Rocky Mountain locust. Reports from farmers of ichneumon flies attacking locusts are not uncommon, because this term is often erroneously applied to any parasite, and especially to the tachina flies and the anthomyia egg parasite, already treated of. Some writers have even sought to justify its application to this last species on the ground that the term ichneumon means an egg feeder, unaware of the fact that it has a definite meaning in entomology, and that while originally applied by Aristotle to an Egyptian animal (*Hespestes ichneumon*, L.) that hunts for and feeds on crocodile eggs, it was also applied, both by Pliny and Aristotle, to a wasp that hunts spiders and caterpillars, for which reason Linnæus appropriately used it to designate the parasitic family we have been considering.—*First Report U. S. Entomological Commission.*

Mount Hood Smoking.

In its issue for May 26, the *Bee*, of Portland, Oregon, says that on the previous day a cloud of smoke hung upon the south side of Mount Hood, far above the snow line and climbing almost to the summit.

"The smoke cloud changed form and movement constantly, apparently pouring out of the south side of the mountain from half to one quarter of a mile below the summit. Those who have ascended the mountain locate the site of an old crater on the southwest side, some distance below the summit. They have to cross this locality to make the ascent, and always find sulphurous fumes issuing from the crevices, and the rocks heated by internal fires.

"There is no doubt that Mount Hood at times sends forth eruptions of smoke, though such manifestations are not of frequent occurrence, or at least are not often reported. We have lived within view of the mountain for nearly thirty years, and have only once before, about fifteen years ago, seen unmistakable emission of smoke, which lasted about an hour, and came from the same part of the mountain that we observed it on May 25, and each time the fact of its being smoke was not to be doubted. Fifteen years ago the phenomenon occurred upon a winter day, when the sky was blue, without a speck of cloud to fleck it, and the smoke streamed northward from the mountain in a dense black cloud. We have seen the time when excitement was created some years ago by the rumor that Mount Hood was smoking. A crowd gathered on a high roof and observed it with glasses, but the phenomenon was caused by atmospheric conditions that drew mists and fogs from the lower gorges, and made them wreath around the summit. The difference between this light colored, enveloping mist, rising from the base of the mountain, and the black, sulphurous appearance of smoke pouring directly out of the side of it from among the snows, was evident to any practical eye. Yesterday morning the sky was clear, with a slight haze and a few light, fleecy clouds hanging above the Cascade range at intervals, but the whole base and summit of Mount Hood were clear of them, while the unmistakable wreath of sulphur smoke hung just below the very summit, remaining there for over two hours, contorted by the movement of the winds. Toward noon fleecy clouds enveloped the mountain, and for a while the difference between cloud and smoke was distinctly visible, but afterward the outlines of the snowy peak were obscured, and when they were plain again, at 2 o'clock P. M., there was no smoke to be seen."

Astronomical Notes.

OBSERVATORY OF VASSAR COLLEGE.

The computations in the following notes are by students of Vassar College. Although only approximate, they will enable the ordinary observer to find the planets.

M. M

POSITION OF PLANETS FOR JULY, 1879.

Mercury.

On July 1 Mercury rises at 5h. 37m. A.M., and sets at 8h. 36m. P.M.

On July 31 Mercury rises at 7h. 19m. A.M., and sets at 8h. 16m. P.M.

Mercury can be seen after sunset all through the month of July. In the early part of the month it keeps nearly the path of the sun; later it should be looked for south of the point of sunset. Mercury may be seen east of the crescent moon July 20. It is at its greatest elongation east of the sun on July 27.

Venus.

Venus rises at 8h. 17m. A.M. on July 1, and sets at 10h. 5m. P.M.

On July 31 Venus rises at 8h. 49m. A.M., and sets at 9h. P.M.

On July 8 Venus passes near to the planet Uranus, but moves rapidly toward the east. Venus will be at its greatest elongation on July 16, and near the crescent moon on July 22.

Mars.

The three bright planets, Mars, Saturn, and Jupiter, can all be seen at a late hour in the evenings of July. Mars and Saturn rise nearly at the same time for several mornings in the first week of July, but Mars moves quickly eastward and northward, and separates from Saturn.

On July 1 Mars rises at 10m. after midnight, and sets at 38m. after noon.

On July 31 Mars rises at 10h. 57m. P.M., and sets at 16m. after noon of the next day.

Jupiter.

On July 1 Jupiter rises at 10h. 46m. P.M., and sets at 9h. 49m. A.M. of the next day.

Jupiter is near the moon on the 8th.

On July 31 Jupiter rises at 8h. 45m. P.M., and sets 7h. 44m. A.M. of the next day.

At this time Jupiter rises as Venus sets.

On July 31 Jupiter, Saturn, and Mars can be seen to rise before midnight. Jupiter will be known by its size and brilliancy, Saturn by its white light, and Mars by its ruddy glow.

Saturn.

On July 1 Saturn rises at 0h. 10m. A.M., and sets at 36m. after noon.

On July 31 Saturn rises at 10h. 10m. P.M., and sets at 10h. 37m. of the next day.

Saturn and Mars are in close proximity on the 1st, but Mars will be seen to move east of Saturn and northward.

Uranus.

Uranus may perhaps be found with an ordinary glass by its nearness to Venus. On July 8 Uranus has the same right ascension as Venus, but is 15 minutes of arc south of Venus. On the 9th Venus has moved eastward and toward the south, and Uranus is left west of Venus and in higher northern declination.

On July 1 Uranus sets at 10h. 18m. P.M., a few minutes after Venus.

On July 31 Uranus sets at 8h. 24m. P.M.

Neptune.

On July 1 Neptune rises at 1h. 12m. A.M, and sets at 2h. 52m. P.M.

On July 31 Neptune rises at 11h. 11m. P.M., and sets near 1h. P.M. the next day.

The Manufacture of Phosphorescent Substances.

A correspondent who resides in Paris sends us the following:

I read in the SCIENTIFIC AMERICAN a notice in which you mention some phosphorescent powders that you found on luminous clock dials. Having ascertained by analysis that this phosphorescent matter is nothing but sulphide of calcium, you say there must be something or other in the mode of manufacture of this substance to give it such a brilliancy as has never been obtained before.

Being in situation to know much about this subject I think it will be agreeable to you if I give you some details on this question.

The phosphorescent matter of the luminous dials is prepared in Paris; the maker is M. André, 39 Rue Lacépède. Twenty years ago, being famulus in Mr. E. Becquerel's laboratory, he was taught by him how to prepare phosphorescent sulphides, and then began to make them for the chief instrument makers in Paris.

The first products obtained had but little intensity; but gradually M. André became more and more skillful in his work, and three years ago he was able to produce the substance you have seen on the dials. Such a wonderful result was obtained only by carefully studying the mode of manufacture, and depending only on a few tricks of hand. This I can affirm, but I cannot give you the details of the manipulation, which are kept secret.

M. André does not make only the blue violet powder used for dials; this color has been chosen for that because it keeps luminous a longer time. But the results are almost as good with yellow, yellow-green, green, and orange powders.

* New York *Weekly Tribune*, November 11, 1874.
† Proc. Bost. Soc. Nat. Hist., Vol. XI., pp. 88 and 89.

* Notes on observations made during the late "Locust Plague:" Report of the Secretary for Agriculture, Melbourne, 1873.

Alleged Discovery of Ancient American Carvings.

The *Pioneer Press* (St. Paul, Minn.), announces the discovery of a remarkable cave on the farm of David Samuels, 10 miles from La Crosse. The cave is 30 feet long, 13 feet wide, and about 8 feet high. Above the quarry sand, which has evidently drifted in and covered the floor to the depth of three to six feet, upon the walls, are very rude carvings representing men, animals, arms, and implements, and some appear to be hieroglyphics. One picture represents men, with bows and arrows, shooting animals, three buffaloes and one rabbit. Another represents three animals, which, if large, must have been like the hippopotamus; another appears to represent a mastodon; on another picture a moose is quite plainly delineated. There are eight representations that are canoes, much carved, or hammocks, which they more resemble. One sketch of a man is very plain; the figure wears a kind of chaplet or crown, and was probably chief of his tribe or clan. There are many fragments of pictures, where the rock had decomposed. The rock is a coarse, soft, white sandstone. On one side of the cave is a space about 2 feet high and 2½ feet in length, made into the wall. Above are the upper fragments of pictures, and below are lower fragments, showing that they were made when the rock was entire. From the depth to which decompositions reached in this dry and dark cavern, the inscription must be quite ancient. If the carving mentioned really represents the mastodon, the work must have been done by mound builders.

The accumulated sand needs to be removed to get a full view, and possibly human remains may be found. The entrance to the cave had evidently been covered by a landslide, there being left open only a small hole, where traps have long been set for coons. The large number of these animals that were caught led to the belief that the space inhabited by them must be large, and investigation led to the discovery of the cave. It is stated that over the entrance, since the landslide, a poplar tree, 18 inches in diameter, has grown, which shows that the cave has not been occupied by human beings for more than a century.

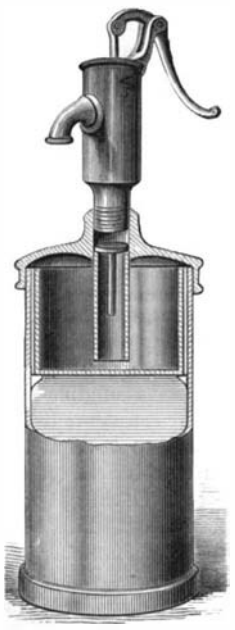
If the above statements are true, this may prove to be a rich find for our antiquarians.

NEW DEVICE FOR SEPARATING CREAM FROM MILK.

A novel device for separating cream from milk is shown in the accompanying engraving. It consists of a can for containing milk, to which is fitted a pan for containing water. The can is provided with an airtight cover, from which a tube projects nearly to the bottom of the water pan. In the top of this tube there is a valve, and a pump is attached to the cover immediately above the tube.

The can is filled with milk nearly to the lugs that support the water pan, and the latter is filled with water and placed in the can. The cover is then put on and fastened, and the pump is applied.

By removing the water from the pan a vacuum is created in the can which is said to greatly facilitate the raising of the cream. This device was recently patented by Mr. S. L. Plumb, of Portage, Wis.



Apparatus for Raising Cream.

The New Austrian Explosive.

The new explosive for military use, recently introduced in Austria, appears to have remarkable properties. It consists of Nobel's explosive gelatine (formed by dissolving gun cotton in nitro-glycerine), with camphor added in varying proportions (nominally 4 per cent). An interesting account of experiments made at the works of Zamky with this explosive is now appearing in the *Revue d'Artillerie*. From experiments on iron plates it appears that, weight for weight, it is 25 per cent stronger than the best Kieselguhr dynamite. The freezing of the charge and the priming cartridge does not diminish the inflammability and shattering force. The explosive is not sensibly altered by being under current water forty-eight hours. Fired at, in the soft state, with a rifle at twenty-five meters distance, it resists the shock; but not if frozen and placed against iron (or against wood, if frozen and containing only 1 per cent camphor). Its superiority, for military purposes, to ordinary explosive gelatine and other explosives is very marked. This new explosive is known as blasting gelatine.

Phosphorescent Powders.

A recent English patent is to obtain and to utilize at night time the light taken or absorbed during the day time from direct or indirect sunlight, or from an artificial light, either by employing phosphorescent powders simply after exposure, or by augmenting their brilliancy by means of electricity. The composition and manufacture of the luminous products and their applications without the use of electricity, is thus described: 100 parts by weight of a carbonate of lime and phosphate of lime, produced by the calcination of sea shells, and especially those of the genus Tridacna and the cuttle fish bone, are to be intimately mixed with 100 parts by weight of lime rendered chemically pure by calcination, and add 25 parts by weight of calcined sea salt; from 25 to 50 per cent of the whole mass of sulphur, which incorporate therewith by the process of sublimation; and from 3 to 7 per cent of coloring matter in the form of powder composed of mono-sulphure of calcium, barium, strontium, uranium, magnesium, aluminum, or other minerals or substance producing the same physical appearances, *i. e.*, which, after having been impregnated with light, becomes luminous in the dark. After having mixed these five ingredients intimately the composition obtained is ready for use according to different methods of application. In certain cases, and more specially for augmenting the intensity and the duration of the luminous effect of the composition, the patentees add a sixth ingredient in the form of phosphorus reduced into powder, which is obtained from seaweed by the well known process of calcination. As to proportion, it is found that the phosphorus contained in a quantity of sea weed, representing 25 per cent of the weight of the composition formed by the five above named ingredients, gives very good results.

The phosphorescent powder thus obtained and reduced into paste by the addition of a sufficient quantity of varnish, such as copal, may serve with advantage for illuminating a great number of objects, *e. g.*, buoys, sea compasses, barometers, street plates, sign boards, and other similar objects, by arranging it in more or less thick coatings upon a plate of metal, wood, glass, or other material, covered by a transparent glass; this powder may also be employed for theatrical scenery or pictures, artificial flowers, and other similar articles by the application of one or more coatings of the powder incorporated in the varnish, or else by varnishing previously these objects and by sprinkling the dry powder upon the varnish still damp, and in this case the covering piece made of glass or other transparent material may be suppressed.

These powders are also employed for manufacturing solid objects generally made of cellulose, paper paste, papier-mache, artificial ivory, sometimes called coralline, and other materials of a similar nature, by sprinkling the surface of these objects, or only certain parts of the surface (still damp or moist) which are usually exposed to light, and by compression in moulds or otherwise in order to incorporate definitely the phosphorescent powders into the surfaces. The amount of powder applied should not exceed the thickness of a thin sheet of cardboard; it may be employed either for coating the whole surface or certain fractions thereof, so as to produce various designs, inscriptions, or effects. For this application various powders are also applied, which contain different coloring matters, so as to produce effects of various colors.

The dry phosphorescent powders are also converted into translucent flexible sheets of unlimited length, thickness, and width, by mixing them with about 80 per cent of their weight of ether and collodion in equal parts in a close vessel, and rolling the product into sheets, with which any object may be covered which is intended to be luminous in the dark.

The phosphorescent powders may also be intimately mixed with stearine, paraffine, rectified glue, isinglass, liquid silex, or other transparent solid matter, in the proportion of from 20 to 30 per cent of the former with from 50 to 80 per cent of either of these substances, and this mass is then reduced into sheets of variable length, width, and thickness, according to their intended applications. A luminous glass is also manufactured by means of the above mentioned phosphorescent powders by mixing the same in glass in a fused state in the proportions of from 5 to 20 per cent of the mass of glass. After the composition has been puddled or mixed it is converted into different articles, according to the ordinary processes; or after the manufacture of an object still warm and plastic made of ordinary glass it is sprinkled with the powders, which latter are then incorporated into the surface of the article by pressure exerted in the mould, or in any other suitable way.

It has been observed after various trials that the passage of an electric current through the different compositions augments their luminous properties or brilliancy to a great extent; this peculiarity is intended to be utilized in various applications too numerous to describe; but of which buoys form a good example. The current of electricity is furnished by plates of zinc and copper mounted on the buoy itself, when the latter is used at sea, but in rivers and fresh water inlets the battery will be carried in the interior of the buoy. To secure the full effect from 10 to 20 per cent of fine zinc, copper, or antimony dust is added to the phosphorescent powder above described. The patentees, Peiffer, MacCarty, and De Sagan, have devised a special form of buoy, which they claim is their invention, in company with the various applications above described.

AN INVENTOR VICTORIOUS.

Under the above heading the Cincinnati *Commercial* of June 10th says:

The suit of John L. Lewis against the Swift Iron and Steel Works of Newport, to restrain them from operating a style of rolls patented by the plaintiff, was decided yesterday in the United States Court. The decree of the court orders that Swift & Co. be for ever restrained from using any of the 14 sets of iron rollers now at the mill in Newport, Ky., and from making or using any roller of like form. It is further ordered that this case be referred to the Master to inquire and report as well the profits realized by Swift & Co. by the use of the rollers, as the damage which Lewis has sustained, and for this purpose the two parties are to bring proof as to how long Swift & Co. have used each set of rolls, with the provision that in the absence of any proof it will be assumed that they have been in use for five years from the beginning of this suit; and as to what royalty Lewis has been receiving for the license and whether the royalty be different according to the size of the rolls. The proof is required to be furnished by the 10th of July, and the case submitted to the court on the 30th of the same month.

This patent for angle iron rolls was granted to John L. Lewis, of Pittsburg, Pa., through the SCIENTIFIC AMERICAN Agency of Munn & Co., and the case between the patentee and the Swift Iron and Steel Works of Newport, Ky., was carried on for a period of more than five years. The letters patent were the object of attack by able patent lawyers, and the case drew considerable attention among iron manufacturers, West and Southwest. It is rarely, perhaps, that a specification is subjected to the test so long continued as was the Lewis patent, but it stood the test well.

Industrial Art in New York.

Hitherto there has been no museum in this city which has given any special attention to the applications of industry to art and art to industry. This want the trustees of the Metropolitan Museum have determined to supply, and have devoted a portion of the new art building, in Central Park, to collections illustrating industrial art. They propose to begin with the applications of metals. Valuable gifts have already been received, others are promised, and more are earnestly solicited. Professor Thomas Egleston, of the School of Mines, Columbia College, has been authorized to receive such donations. Communications relating to the matter may be sent to him or to the Director of the Museum, Gen. Di Cesnola. The department is an important and useful one, and it is to be hoped that contributions will be liberal.

Disastrous Earthquake in Sicily.

The region about Mount Etna was shaken by a violent earthquake June 18. Five villages near Aci Reale, a few miles northeast of Catania, were almost wholly destroyed, with serious loss of life. The eruption of Etna had subsided materially.

IMPROVED ANCHOR.

The engraving represents an improved anchor recently patented by Messrs. Spedden & Stafford, of Astoria, Oregon. It consists in a single fluke pivoted in a frame and provided with cam-shaped tripping arms at its base. The frame or shank serves both as a shank and stock, and it has no projecting arms to entangle the cable or chains so as to foul it, and its action is rendered positive by the action of the trip arms.

A Novel Anchor.

Solution for Electro-Plating with Copper.

The following recipe is for a solution for electro-coppering iron, lead, zinc, pewter, etc.: Weigh out, sulphate of copper, one drachm; tartaric acid, two drachms; caustic potash (in sticks), two drachms. Dissolve the sulphate of copper in about half a tumblerful of water. Also dissolve a small quantity of washing soda (about 2 drachms) in warm water, and add the soda solution to the copper solution. Just enough should be added to throw down all the copper in the form of a green precipitate—basic carbonate of copper. This precipitate has now to be separated from the fluid, which is a solution of sulphate of soda. The quickest way to effect the separation is by filtration, in which a piece of blotting paper, folded twice and adjusted within a funnel, may replace the usual filter paper. The *Electrician* says that if time be no object, the precipitate may be allowed to subside, and the clear solution afterward poured off. In either case the precipitate should be washed with clear water in order to remove the last portions of the soda solution. Now dissolve the tartaric acid in a small quantity of warm water; get the moist copper precipitate into a tumbler, and pour the tartaric acid solution upon it. Effervescence will take place. Wait until all the gas—carbonic acid—is evolved; then put the sticks of caustic potash into the tumbler, and add sufficient water to make up at least half a tumblerful—one gill—of solution. The potash dissolves the copper precipitate, the fluid becoming of a beautiful blue color, without any sediment.

Ancient Intercourse with China.

The Chinese Ambassador, Li-Fang-pao, at Berlin, says that from the Chinese inscription on one of the vases found by Dr. Schliemann on Trojan soil, it is proved that there was traffic between China and European boundaries about twelve hundred years before Christ. The gauze linen found by Dr. Schliemann in the vase was made in China. Li-Fang-pao contends that the Hyperboreans were Chinamen.

Correspondence.

The Cause of Consumption.

To the Editor of the Scientific American:

In your editorial of May 31 upon my views of the cause of consumption you say: "Regular physicians will be apt to say" I have "mistaken a condition for a cause." That such a mistake might be made upon so complicated a subject is no doubt a natural inference, and I do not write to complain of it—far from that—but to call attention to a few facts which show how little chance there is to make a mistake in this important matter.

I cannot see, for instance, how it is possible to mistake a condition for a cause in consumption any more than in Bright's disease, with that feature of either disease that is identical in both; that is to say, it is difficult to see how the loss of albumen from the blood through the kidneys, in Bright's disease, can be considered the cause of the disease, while an equal or greater loss of albumen from the blood through the lungs, in consumption, should be held to be only a condition of that disease. The mistake would certainly be in divorcing the two losses in that way, and say that the waste of identically the same element from the blood meant one thing in the one disease and an entirely different thing in the other.

The entire medical profession of all schools, and without exception, stands committed to the teaching that a discharge of albumen from the kidneys is the cause and the only cause of Bright's disease, and of all that follows in those cases up to and including death; also, that it is one of the most fatal of all diseased conditions. And the fact that all of the albumen so discharged is a direct waste or loss of just so much of it from the blood is proved by the following from Carpenter's "Physiology," page 189, where, in speaking of Bright's disease, he says:

"According to Andral the diminution in the amount of albumen in the serum is exactly proportional to the quantity contained in the urine."

Language could not be more definite and positive than that. There never was a case of Bright's disease without the discharges from the kidneys containing albumen. That constitutes the disease. It is the first, the last, and the only symptom, with barely one minor exception, viz., fibrinous casts of the uriniferous tubules, by which the disease is known or can be recognized with certainty to exist during the lifetime of the patient. All other manifestations of the disease are common to several other diseases.

With consumption also the very first departure from health is a discharge of albumen through or from some one or more of the organs lined with a mucous membrane, more generally of course from the air passages; still many cases are commenced by a waste of albumen through and in consequence of chronic irritations and abrasions of the mucous membrane of the stomach, of the bowels, or of the genital organs of females, until the system is exhausted to a certain extent, when in many of these cases the disease will leave those parts and be transferred to the lungs, or be driven to them by wrong treatment, there to complete its final work. The waste of albumen continues, too, in all cases of consumption, and generally in an increasing quantity, to the close of life; so it is the first and among the last symptoms of the disease, but by no means the only certain indication of it, as in Bright's disease. Indeed, consumption has ever, hitherto, been recognized solely by other symptoms and appearances, and the fact of the loss of albumen has never before been taken into consideration as a constant attendant of the disease, much less has it ever before been even suspected of being the true and only cause of it. But there never would have been and never could be a case of consumption but for the waste of albumen, any more than there could be a case of Bright's disease without that.

And that the appearance of albumen in the discharges in all these cases is a loss or waste of just so much of it from the blood, the same as in Bright's disease, is a self-evident fact, for there is no other possible source from which it can be drawn but from the blood.

Again, never a case of consumption occurred without the blood becoming too watery long before tubercles began to organize, and getting more and more watery as the case went on and the waste of albumen increased; and nothing causes this too watery condition of the blood but the loss of albumen therefrom, excepting with those in poverty, who are compelled to live on too watery food, or that which does not contain sufficient albumen. And here it may as well be said that nothing is food for man that does not contain considerable albumen; and that which contains the most of it, other things being equal, is by far the best.

To recapitulate the main facts in this subject, then, so that any intelligent mind will be able to grasp it as a whole: The first departure from health in consumption is marked by a waste of albumen, always from the blood, and the increase in severity of any and all symptoms of the disease is marked by an increasing waste of albumen; the watery condition of the blood is solely due to such waste, and the blood becomes more watery as the waste becomes greater, because of the increasing relative excess of water left in the bloodvessels by it; this excess of water causes the night sweats and dropsy, which get worse as the loss of albumen increases; the blood corpuscles left in excess are decolorized by circulating in the too watery serum and become the so-called tuberculous corpuscles, which also increase in numbers as said loss progresses; the excess of fatty matters causes the fatty livers, etc.; the excess of fibrin causes the adhesions of the pleura, which become more and more extended as the cause of all advances; the same general fact holds in regard to the excess of salts producing their characteristic troubles, which increase with all else; and finally, the characteristic emaciation of consumption keeps exact pace with the waste of albumen; when this progresses slowly that progresses slowly, when this goes on rapidly that goes on rapidly, for the simple reason that the muscles are being robbed of a portion of their only food, and must shrivel in the exact ratio that that is taken from them.

By such a presentation of the facts of the case I trust all will now be enabled to see how almost impossible it is to make any great mistake upon any point in this subject; also that every part of it is so intimately and inseparably connected with every other part, that it must be considered as a whole, if we would deal intelligently with it. And this leads me to call attention, in conclusion, to the fact that, as you inferred at the close of your editorial, the treatment of consumption must be radically changed in almost all respects to correspond with the real cause, and with this great chain of events as they naturally occur in the disease, or there is no hope of the profession ever doing any more in the future than it has in the past in mastering this greatest of all the scourges of mankind.

ROLLIN R. GREGG, M.D.

Buffalo, N. Y., June 10, 1879.

ENGINEERING INVENTIONS.

Mr. W. H. Maple, of Chariton, Iowa, has recently patented an improved car coupler, which employs a combined link and pin. It is certainly very simple, and it appears to be a safe and practical device. It is operated from the side of the car, thereby avoiding the accidents common to the old link and pin coupling.

An improvement in drill jars, consisting in forming the links with rounded outer and inner surfaces and cylindrical anvils or striking heads, arranged inside at the ends of the links to receive the impact when the drilling tool is lifted, has been patented by Mr. J. E. Hughes, of Barnhart's Mills, Pa.

An improvement in hand and horse power fire engines has been patented by Mr. A. S. Walbridge, of Mystic, Quebec, Canada. Three or more pumps are arranged radially around a vertical shaft, and operated by a single crank. The shaft is fitted with a hub for carrying sweeps, so that it may be driven by hand or horse power.

An improved centrifugal ore pulverizer and separator has been patented by Alexander Goodhart, of Carlisle, Pa. The invention relates to the construction of a cylinder, into which the ore matter is first received, and in which it receives a preliminary pulverizing. This cylinder is surrounded by another cylinder, that revolves in the opposite direction, and completes the pulverizing process.

Mr. Sylvanus B. Nickum, of Jalapa, Ind., has patented an improved railroad switch, which may be operated from the locomotive or from the rear car of the train. The switch rails are operated by a lever, which is pivoted to one of the ties, and is engaged by a pin on the locomotive or car, the pin being arranged so that it may be dropped down into position to engage the lever or raised up out of the way.

Henry Reese, of Baltimore, Md. (not Ruse, as given in a recent issue), has patented in this country, a railway cross-tie, of wrought iron, to which the rails are fastened by means of a permanent lug and removable clamp at each end of each tie. Both lugs face toward the same end of the tie, and the alternate ties are reversed end for end, so that the permanent lugs alternate on opposite sides of the base flanges of the rails. The movable clamp is held to its place by a simple form of spring, which takes up all wear and keeps the fastening tight and rigid. Patents are pending for the same invention in several European countries.

The Steam Engine of the Future.*

In the form of a pamphlet the well known author of many valuable works on the steam engine has now given forth some admirable suggestions, and sensible previsions, as to the future of the wondrous machine. We shall at present content ourselves with allowing Mr. Bourne to speak for himself on this pregnant subject. He observes that "the benefit of working steam engines expansively is well known to engineers, as also the necessity of employing a steam jacket in engines so worked, to obtain the full benefit of the expansive principle. It is not generally known, but is nevertheless the fact, that in high speed engines there is a further benefit arising from the inability of the cylinder to become sensibly heated and cooled at each stroke, from the shortness of the time given for that process, and in such engines the cylinder approaches to the condition of a non-conductor, which is known to be favorable to the economical generation of power. Then, in the case of all high pressure engines, it is easy to see that a considerable pressure must be more beneficial than a lower pressure. To raise a given quantity of water into steam takes just the same quantity of heat, whether the evaporation is effected at the pressure of the atmosphere or at six or eight times that pressure. But at the low pressure the steam will not generate any power, whereas at the high pressure it will generate much power. A very high pressure of steam, however, is inconvenient, as it involves a correspondingly strong and heavy boiler, an extra strong and heavy engine, and separate expansion gear, which is not compensated by the small amount of increased economy obtained from excessive pressure. I have found a pressure of about eight atmospheres to be, on the whole, the most eligible that can be adopted. . . .

"Supposing a good and cheap small engine to be available—an engine that will be strong, simple, safe, light, noiseless, and economical in fuel—not only would all its industrial applications be extended, but it would find a new and wide sphere of usefulness in ministering to domestic wants, one of the most widely pervading of which is the want of a simple motive power. In American hotels steam engines have long been employed for brushing boots and cleaning knives. They are the docile and inexpensive Helots of the age, and the domestic production of the electric light is a new and important sphere for their energies. But besides these functions, a domestic engine may be employed in roasting meat, driving washing machines and mangles, driving sewing machines, in brushing hair, in preparing aerated waters, and in the country for pumping, for sawing wood, and for performing many other laborious operations. A steam engine may be made to cool houses in summer and to warm them in winter, to maintain fountains in conservatories, to work punkas, to produce ice, and to create and maintain a vacuum in safes for the preservation of meat. For such purposes the engine must obviously be of the simplest, most compact, and most inexpensive character, and should be attached to the boiler, so that the whole may be lifted in a piece, like a hall stove. The boiler should be provided with a self acting feed of water, and the fuel should be gas, which has only to be lighted to enable the engine to be put into operation. Gas companies will find ample compensation for the loss of their lighting function in the creation of a new heating function, which will become larger and more remunerative than the lighting has ever been. Instead of extracting from the coal only the illuminating gases, the whole fuel should be turned into combustible gas by the aid of superheated steam, and all the fires of houses could be maintained by this cheap gas burning in jets amid pumice, which it would keep red hot. There would then be neither dust from grates nor smoke from chimneys, and the gas-works would supply the fuel that is necessary for the generation of the electric light.

"I cannot pretend in this brief notice to enumerate all the improvements which the steam engine of the future should comprehend; but one essential quality is, that the boiler shall not be liable to internal incrustation, and that there shall be abundant facilities for easily cleaning it out. Most waters contain a certain proportion of lime, which is precipitated by boiling, and in tea-kettles this lime forms an internal crust, which is termed 'rock.' Such incrustation hinders the transmission of heat through the metal of a boiler, and is injurious in various ways. But there are known means of preventing its formation, and in the 'steam engine of the future,' it is an indispensable feature that these means shall be embodied.

"The application of the steam engine to the propulsion of carriages, omnibuses, and cabs, is now only hindered by its too heavy weight and too high cost. Asphalt pavements, which are objectionable for horses, afford for steam carriages a surface as eligible for easy traction as a railway, and without any countervailing fault. All wheeled vehicles, whether required to travel at a high or a low speed, will be propelled by steam instead of horses as soon as the steam engine is made sufficiently light and sufficiently cheap to warrant the substitution. Life boats, instead of being open boats propelled by a number of men, should be decked boats propelled by a steam engine, and managed by only two men, one to steer the boat and the other to attend to the engine. Such boats should be propelled by a water jet which will always act, whatever may be the roughness of the sea, and whether the stern of the boat is in or out of the water. The use of the steam engine for irrigation in connection with the centrifugal pump is an application of which the sphere is limited only by the cost and the deficient portability of the apparatus. To render the class of small engines so much more portable, so much more simple, and so much less costly as to remove the existing impediments to their use, may certainly be accounted one of the most important problems of the present time, and I trust it is not presumptuous to hope that the cursory hints here given may accelerate the desired solution.

* "The Steam Engine of the Future, and the Future of the Steam Engine." By John Bourne, C.E. London: John Bourne & Co., 66 Mark-lane. 1879.—From *Foreman Engineer and Draughtsman.*

Comparative Longevity.

Herr Max Waldstein, of the Statistical Department at Vienna, says, in a recently published pamphlet, that the number of people in Europe who are upward of 90 years old is 12,831, of whom 60,203 are women. Of those who are over 100 years of age, there are 241 women and 161 men in Italy, 229 women and 183 men in Austria, and 526 women and 524 men in Hungary. There are in Austria 1,508,359 persons over 60 years of age, comprising 7·5 per cent of the whole population. It is found that the percentage of old people is much higher among the Germans than among the Slavs. In the German provinces of Upper Austria and Salzburg it is 11·5, while in Galicia it is only 4. In Hungary there are more old men than old women, which is explained by the fact that the excess of women over men is less in Hungary than in other countries. According to Herr Waldstein there are in Austria 100 women and 86 men who are 100 years old, 41 women and 37 men who are 101, and 88 women and 60 men who are upwards of 101 years of age.

AN OLD CONCERN RE-ESTABLISHED.

Horace Waters & Son, dealers in musical instruments in this city, made an assignment not long ago to secure their creditors. Mr. Waters, Sr., after thirty years' experience, hopes, by enterprise, economy, and fair dealing, to re-establish his business and to retain his old customers. To this end, he has opened a store a No. 40 East 14th St., and acts as agent for a number of leading musical instrument manufacturers.

Business and Personal.

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

NEW BOOKS AND PUBLICATIONS.

CAPTAIN LILL'S GRAPHICAL METHOD. By Lieutenant William H. Bixby, U. S. A. West Point, N. Y.: printed for author. Paper, pp. 16. Price 20 cents.

This graphical method for finding the real roots of numerical equations of any degree, if containing but one variable, was first exhibited by Captain Lill, of the Austrian service, in 1867. Lieutenant Bixby presents it for the first time in English, and adds a demonstration of its correctness.

Notes & Queries

HINTS TO CORRESPONDENTS.

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

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

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

Correspondents whose inquiries do not appear after a reasonable time should repeat them.

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

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

(1) J. B. T. asks: Does the horseshoe magnet lose its power by use, and where it is used in frequent contact with the steel parts of a machine will it so magnetize those parts as to render the magnet useless? A. A magnet by constant use is enfeebled, but it may be readily recharged.

(2) B. B. B. writes: Vol. XL., No. 22, p. 348, "Answers to Correspondents" (17), to R. J. F. Are you quite sure? The resistance increases with the square of the velocity, and a bullet with a heavy charge of powder may be flattened by firing it vertically down against the surface of a pail of water. A. The penetrating force increases as the square of the velocity; the resistance is not so increased, but is determined by the character of the resisting material. "The measure of the penetrating force is stated by all authorities to be the weight of the shot, multiplied by the square of the velocity at the moment of impact." Now as the velocity is greatest at the instant the projectile leaves the gun, the nearer the resisting material the deeper it must necessarily be penetrated.

(3) J. G. B. writes (1) whether it is not better to use a stripping solution in nickel plating; if so, should it not be made stronger than the regular plating solution? A. Good nickel platers consider such a solution unnecessary. 2. Am I right in using the carbon battery in nickel plating? A. Carbon (bichromate) batteries are often used, but the best plating is done with a battery of lower electro-motive force—such as that of Smee. 3. I have tried to dissolve platina with 1 part nitric and 2 parts muriatic acids without success; please tell me why. A. Use more hydrochloric acid (1 of nitric to 3 of hydrochloric), and apply a moderate heat, decant the solution, and add fresh acid until all (if the metal is free from osmium and iridium) is dissolved. Platinum does not dissolve very rapidly. 4. How is bright gilding done? A. Without knowing something as to the surface you propose to gild, we cannot give the required information.

(4) E. N. asks (1) how to proportion a safety valve. A. See rule for calculating safety valves in answer (29), p. 267, vol. 40, SCIENTIFIC AMERICAN. 2. How to calculate the strength of boilers? A. We must refer you to rules published by Haswell, Clark, Molesworth, and other authors. A note to cover the whole question would be too long for our "Notes and Queries."

(5) L. B. asks how to preserve insects. A. Laboulliere recommends plunging the insects, in the fresh state, into alcohol which has been saturated by digestion with arsenious acid (1½ pint will take up about 14 troy grains of arsenic). The living insect put into this preparation absorbs about 0·003 of its own weight. When soaked in this liquid and dried the specimens are safe from the ravages of moths, *anthrenus* or *dermestes*. This treatment does not affect the color of blue, green, or red beetles, if dried after soaking for 12 to 24 hours. *Hemiptera* and *orthoptera* can be treated in the same way; also the nests, cocoons, and chrysalides of insects.

(6) M. M. A. writes: In discussing the answer to question No. 30, of May 17, 1879, page 316, a few inquirers could not reconcile your answer with the principle that the "pressure of water increases as the depth." Would you kindly clear up the difficulty? A. A pipe to hold three times the quantity must have three times the area, or be 10·4 inches diameter nearly; now as strength of a pipe is inversely as the diameter, it is evident that if the strength were but just sufficient for a pipe 6 inches diameter, it would be entirely too weak for one 10·4 in diameter.

(7) G. W. B. asks for instructions as to the proper kind, size, shape, etc., of furnace, that will be inexpensive to build, suitable for the economic melting of zinc in say fifty or hundred lb. lots. A. An ordinary cast iron melting pot, of sufficient capacity, seated on brickwork over a shallow furnace with a moderate draught, answers very well.

(8) G. H. H.—You may consult Britton's "Treatise on Dry Rot, and the Means of Preserving Timber from Destruction by Sea Worms, Beetles, Ants, etc."

(9) "Hercules" asks for an explanation of the difference between a "flue" and a "tubular" boiler. A. Formerly the distinction was between a welded tube drawn through dies and flues of so large a diameter that they were riveted together; but within the past 4 or 5 years the tube makers have enlarged their machinery, so that now welded and drawn tubes (or flues) are made up to 18 or 20 inches diameter, so that the line of distinction between the tube and flue is in a measure wiped out; probably in engineering language, flues of 6 inches diameter or less would be termed tubes, and larger diameters, flues.

(10) J. G. D. asks: 1. Suppose we place a gun perfectly level, 3 feet from the ground, and have force enough behind the ball to cause it to go 100 yards over a level plane. The question is, will the ball rise above the starting point, or can a ball be forced that distance without its rising above the level of the gun? A. It will not rise higher than the starting point. 2. Suppose we have the gun in the above position, and so arranged that the same spring that causes the first ball to start will also cause a second ball to fall from the same point to the ground. The question is, which ball will strike the ground first? A. If we understand your question, they will both fall in the same time.

(11) B. E. H. asks for the right ascension and declination of Mercury, Venus, Mars, Jupiter, and Saturn, for the 13th day of June, 1860. A. The following are the positions of the planets named at the time of transit at Washington, on the 13th of June, 1860, Washington mean time:

Mercury ...	R. A.	6h	6m	0·70s	Dec. N. 25°	7′ 28·5″
Venus		8h	15m	57·16s	21°	14′ 50·1″
Mars		20h	13m	24·28s	23°	58′ 8·7″
Jupiter		7h	35m	12·13s	21°	17′ 20·0″
Saturn		9h	37m	56·22s	15°	34′ 3·6″

2. How is right ascension and declination of the planets found for the past or future if it is known for any one time? A. That all the planets move in elliptical orbits is Kepler's first law, and that a line drawn between the centers of sun and planet sweeps over equal spaces in equal times is his second law, and answers your second question; but a complete elucidation of this would occupy too much of our space.

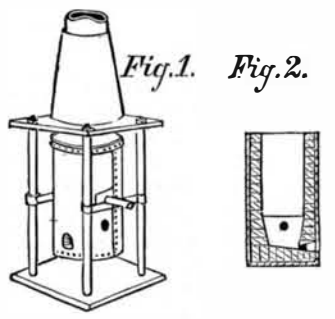
(12) D. F. writes: I read in one of your back numbers that if 14 grains of bichromate of potassium were dissolved in one ounce of gelatine and poured upon a ground glass plate, and dried in the dark, by placing a negative over the dried bichromate surface and exposing it to the rays of sunshine for a few minutes, then ink it over with printer's ink and place it in a water bath, after which the water will cause all parts that the light did not come in contact with to float away, leaving the image standing in bold relief, from which any number of prints could be taken by merely using it as a dye, upon plain paper. I did just as the paper said, and made a sad failure. So that you may thoroughly understand me, I have given you the process in full. Can you give me further information? A. Like many others you have misinterpreted the necessarily brief instructions, and have attempted the process without informing yourself as to its rationale. You will find much useful information respecting photo-printing processes in Vogel's "Chemistry of Sight and Photography," and in the back numbers of the SCIENTIFIC AMERICAN.

(13) C. W. H. asks: How are postage stamps printed: what kind of ink is used? A. They are printed in sheets of 200 each in heavy presses, with fine copper plate inks. The precise composition of these inks is not made public by the government printers or bank note companies. The colors are: blue 1 cent stamp, ultramarine—sulphide of sodium and iron and silicate of alumina; red 2 cent stamp—vermilion—sulphide of mercury; red 90 cent stamp—carmine; green 3 cent—Prussian blue with chrome yellow.

(14) S. A. J. asks (1) if there is any way to clean or keep clean the roof of the furnace of an upright tubular boiler where there are no hand holes. I have used locomotive and stationary boilers, but this is the first upright, and I am at a loss to keep it clean. A. You should have some small cleaning holes at the level of the crown of the furnace to clean and wash off the plate. 2. Also, where should the gauge cocks be? I have noticed in short boilers they are nearer the furnace than long ones: is there a rule for them? A. There is no rule; they should be low enough to leave sufficient steam room.

(15) J. T. B. asks: 1. How far up from the entrance of flue into a chimney ought a steam jet be introduced to increase draught? A. It depends upon the height of chimney and pressure of the escape steam; the jet should be able to drive the whole column of air in the chimney at a rapid velocity. 2. In what form should jet be fixed in chimney? A. A cone with the end of opening bell shaped. 3. Will it injure materially a brick stack? A. No, if the temperature of gases in chimney is sufficient to prevent condensation.

(16) C. O. M. asks how to make a small furnace suitable for melting from 10 to 25 lb. of cast iron; what to use to produce sufficient blast. A. The accompanying figures will give a very good idea of a small cupola for melting iron. Fig. 1 being a perspective view, and Fig. 2 a section of the cupola. The body is made of heavy sheet iron, lined with fire brick, and provided with trunnions by which it is supported on cross bars in a frame composed of two iron plates about two feet square, separated by four 4½ foot columns of 3 inch gas pipe, the whole being fastened together by four long bolts which pass through both plates and through the columns. The upper plate has a large opening and a flange or collar for receiving the base of the chimney. The cupola has openings on opposite sides to receive the blast nozzles or tuyeres, and a tap hole in front. It should be about 3 feet high, and 14 inches internal diameter. The base of the chimney should have a door through which to charge the cupola. The blast may be supplied with a large bellows, but a small fan blower will answer much better. For the quantity of iron mentioned a cupola two thirds the size given would answer.



(17) C. E. S. asks: What are the ingredients used in making the copper ruby stain for ornamenting the common glass petroleum lamp cisterns and cheap vases? A. Use a soft (lead) glass containing about 3 per cent of protoxide of copper. Stir the pot occasionally with a stick of green wood, or add a little tartar, to prevent higher oxidation of the copper, which would then produce a greenish glass. The proper color appears only upon annealing.

(18) N. W. asks: How can I cut a round hole in a pane of glass and save the pane—do not care about saving the inside; want to cut a hole 6 inches in diameter; have tried a diamond without success? A. Use a copper tube of the size of the required hole; revolve it in contact with the glass, and supply it with emery and water.

(19) G. P. asks: 1. Can eggs and pears be preserved by being kept in rarefied air or in air-tight jars? A. No, not practically. 2. Can eggs preserved with lime be changed so as not to show it? A. Dip them momentarily in acetic acid, then in cold water, and let dry in the air. 3. What is the most successful way to preserve apples and pears? A. Either by thorough desiccation, or in sugar sirup or glycerine from which the air has been expelled by boiling.

(20) R. D. K. asks: 1. What is the specific heat; specific gravity (in liquid and gaseous state respectively); caloric of fluidity or latent heat; volume at boiling point under pressure of atmosphere; point of congelation; point of liquefaction under given pressure; and atomic weight of each of the following substances, stating unity—Chloride of methyl, ether, nitrous sulphurous oxide, ethyl chloride, methyl bromide, aldehyde, methyl forminate, ethyl bromide, methyl iodide, carbon disulphide, bromine, acetic ether, hydrogen, and ammonia? A. Specific heat—1·2266, nitrous oxide 0·3447, sulphurous oxide 0·3144, ethyl chloride 0·6096, ethyl bromide 0·7026, carbon disulphide 0·4122, bromine 0·3040, acetic ether 1·2184, hydrogen 0·2354, ammonia 0·2996. Specific gravity—ethylic ether +20°, 0·713; 0°, 0·736. Nitrous oxide 1·525, sulphurous oxide 2 21, ethyl chloride 0·874, methyl bromide 1·66, aldehyde 0·807, ethyl bromide 1·47, methyl iodide 2·22, carbon disulphide 1·27, bromine (liquid) 2·976 (vapor) 5·54, hydrogen 0·0693, ammonia 0·589. Latent heat (steam = 1)—methyl formate 0·219, methyl iodide 0·086, carbon disulphide 0·162, bromine 0.085, acetic ether 0·173. For other data required consult "Constants of Nature," published by the Smithsonian Institute, Washington.

(21) J. B. writes: My house is at the bottom of a hill; after a heavy rain the water bursts in through cellar walls and bottom How can I prevent it? Would cement answer the purpose? The house is too near the line of another's land to admit of digging a drain. A. Doubtful if cementing would be effective; better carry a drain below the cellar bottom.

(22) F. C. S. asks: 1. What is the power of an engine with (7) seven inch stroke, (6) six inch bore, running (120) one hundred and twenty revolutions per minute, with (60) sixty pounds of steam? A. See p. 267 (4), current volume of the SCIENTIFIC AMERICAN. 2. Is the steam pipe, 1½ inch (outside measure), large enough to supply steam for such an engine? A. Yes.

(23) J. J. S. asks how to determine, without a test, which will be the north or south pole of an electro-magnet. A. In electro-magnets, the south pole is always found at that end where the positive current enters a right handed helix. See forms of electro-magnets, with 51 engravings, in SUPPLEMENT, No. 182.

(24) J. R. asks how it is that dynamite is said to exert a greater force downward, and gunpowder upward when they explode? A. This is a misconception. Nitroglycerine (the explosive agent in dynamite) yields on exploding about 900 times its volume of gas; gunpowder but 300. This gas, suddenly liberated, must displace a portion of the atmosphere, which presses with a weight of about 9 tons upon each square yard of surface. To lift such a weight in the exceedingly short space of time occupied in the explosion of a charge of nitro-

glycerine (in the form of dynamite or otherwise) would require a force greater than to split a rock, and the rock yields. Gunpowder yields but 1-3 as much gas on exploding, and the complete combustion of its grains requires an appreciable amount of time. Nitroglycerine explodes all but instantaneously.

(25) W. B. asks: 1. Have Zamboni's dry piles ever been made of silver and zinc, and why do they not frequently make them so? A. We do not know that Zamboni's dry piles have ever been made of zinc and silver plates. Probably the reason why they are not made in this way is because an unnecessary amount of metal would be used; the silvered or tinned paper is found sufficient. 2. How long will they give an electrical current? A. They will give a feeble current which may last for years. 3. Can I do plating with Zamboni dry piles? A. No, the current is too slight. 4. Why must the gravity battery copper wire be inclosed in rubber or gutta percha? A To prevent a short circuit.

(26) R. W. D. writes: I use the water pipes running through our house for a ground wire on a local telegraph wire. 1. Is there any danger of lightning doing any damage to the house? If so, what danger is there? A. If the wire connected with your water pipes is of sufficient size we think there is no danger; however, we advise the use of a lightning arrest. 2. How often should Callaud batteries working a telegraph wire on a closed circuit and never cut out, be cleaned? A. The Callaud battery, if properly cared for, will not need cleaning until the zinc is exhausted.

(27) R. W. R. asks for a recipe for making a good cheap mucilage. A. Add British gum (dextrine) to a quantity of hot water until a sirupy liquid is obtained; then add a few drops of clove oil and cool for use. See also receipt on p. 347 (7), current volume.

(28) A. L. asks if there is anything that will stop (superfluous) hair from growing? A. See p. 75 (26), 91 (1), volume 39 of SCIENTIFIC AMERICAN.

(29) J. B. R. writes: I wish for a recipe for making water pens, the kind to dip in water in order to write. A. Moisten one of the soluble aniline blues or violets with thin gum water to form a paste, which will harden sufficiently on drying.

(30) E. E. G. asks: 1. Have paper wheels for cars ever been tried without a tire of iron or steel? A. No. 2. Are paper wheels now in use? A. Yes. 3. If so, where? A. On many railroads, including the Metropolitan Elevated in this city. 4. Have they iron tires? A. Yes, iron or steel. 5. How are the wheels fastened to the axle? A. By iron hubs or centers.

(31) R. H. & C. M. A.—We are offered an engine which has a cylinder 10 inches bore, 20 inch stroke, which we are recommended to use with 75 lb. steam as shown on gauge on boiler, and to make 150 revolutions per minute. By your rule for calculating horse power, this would seem to give us 89¼ horse power, which seems to us to be overrated. A. If the average pressure on the piston be 75 lb., your result is correct; but a deduction of say 15 per cent should be made for friction.

(32) R. D. B. asks: What length, thickness, and kind of charcoal ought to be used to produce an electric light on the plan as mentioned in SCIENTIFIC AMERICAN SUPPLEMENT, No. 162, page 2577, Fig. 29, equal to the light of two (4 foot) gas burners; and also how many batteries (Grenet style with carbon plates 4x9 inches) it would take to run said light? A. You will find the small pencils of carbon made expressly for electric lights, much better than charcoal. The pencil should be about 3-64 inch in diameter and ½ to ⅝ inch long. Eight cells of the size given should afford a fine light, but with the Grenet battery the light will be temporary.

(33) W. A. P. asks: 1. What is it that carriage makers use for setting the boxes in the hub with some kind of cement? A. The boxes are usually secured by wedges. We do not know of a cement that would answer the purpose. 2. What means will I use to get a fine finish on a buggy bed before varnishing: is it best to grind paint that I get in tin can, before using? A. After applying the several coats of paint, including the priming, the rough coat—which is rubbed down—and the final coats giving the color, apply a coat of good rubbing varnish, and when it becomes thoroughly dry, smooth and polish it first with finely pulverized pumicestone and water, and second with rottenstone and water. Finally apply a flowing coat of fine copal varnish.

(34) H. E. P. asks: Do dead centers ever occur in vertical, direct acting engines, or, in fact, any kind of a single engine, whether vertical or horizontal, with fly wheel or direct acting? A. The term dead center applies to all reciprocating engines; it is that exact point from which the direction of movement of the piston is changed, or that point where the pressure exerted upon the piston has no effect upon the rotating motion of the crank and shaft. The set of valves, point of cut off, or any other of the details of the arrangement of the engine, have nothing to do with it.

(35) T. G. asks (1) what the so-called fire kings use to rub on their skin to protect them from being burnt with the red hot iron they use in their performances. A. Water alone is commonly used, we believe. 2. What is the composition of aqua vitæ or water of life? A. Aqua vitæ—brandy, spirit, alcohol.

(36) C. W. asks: 1. What size and how much wire will I need in each spool to make an electrical gyroscope, as illustrated in SCIENTIFIC AMERICAN, No. 22, volume 38, and what length and thickness of core? A. The dimensions of the gyroscope referred to are as follows: Diameter of wheel, 2½ inches; rim, 5-16 inch square; diameter of magnet cores, ⅜ inch; length of magnet cores, 1 inch; between centers of magnet cores, 1⅜ inch; width of armature, ½ inch; thickness of armature, ⅛ inch; magnets wound with 6 layers No. 20 silk covered wire. 2. How much battery is necessary to work the same? A. 4 Bunsen cells in good order will run it, but 6 cells would be better. 3. Will ordinary zinc and copper cell do, of one quart capacity? A. Yes, but it will require from 12 to 15 of them. 4. Can I use a pair of Bell telephones for microphone experiments, by substituting a soft iron core in place of magnets? A. Yes. 5. How much battery will I need to work a line say of less than 300 yards in length? A. 2 or 3 Fuller cells.

(37) D. C. W. asks how to clean gravestones without acid. A. Use stiff wire brushes of different sizes, and plenty of water.

(38) J. H. asks what are the uses of mica, and what is its value. A. Clear sheet mica is chiefly used for lights in the doors of stoves and furnaces, for lanterns, lamp chimneys, and transparencies, and in the manufacture of various toys, etc. Put up in pound packages it sells for from 40 cents to $2.75 per pound, according to size and quality of the sheets. Untrimmed sheets are generally unmerchantable. It has been used successfully for roofing purposes.

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

J. J. K.—1. Gypsum—sulphate of lime—used for manufacturing plaster of Paris and as a fertilizer. 2. The fragments are probably of meteoric origin.

COMMUNICATIONS RECEIVED.

On Patent System. By J. W.
On the Hypothenuse. By T. F.
On Smoking Coffee for Consumption. By T. H. K.
On Yellow Fever Manual and Squaring the Circle. By A. J. M. T O. C.
On the License System. By J. H.
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A Mechanic's Theory of the Solar System. By W. W.

[OFFICIAL.]

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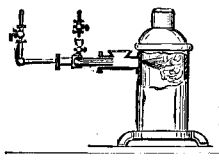

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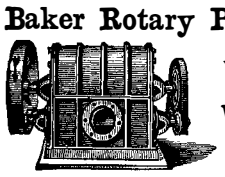

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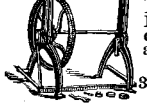

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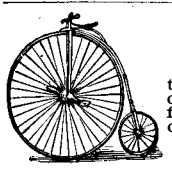

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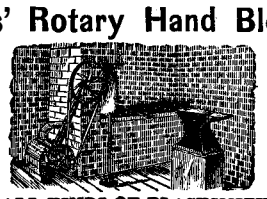

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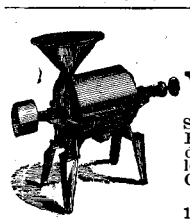

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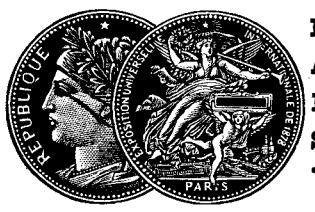

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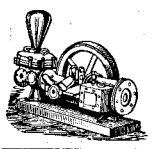

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