SCIENTIFIC AMERICAN

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

Vol. XLI.—No. 1. [NEW SERIES.] NEW YORK, JULY 5, 1879. [$3.20 per Annum. [POSTAGE PREPAID.]

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.

Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT
NO. 37 PARK ROW, NEW YORK.

O. D. MUNN. A. E. BEACH.

TERMS FOR THE SCIENTIFIC AMERICAN.

One copy, one year, postage included $3 20
One copy, six months, postage included 1 60

Clubs.—One extra copy of THE SCIENTIFIC AMERICAN will be supplied gratis for every club of five subscribers at $3.20 each; additional copies at same proportionate rate. Postage prepaid.

☞ Single copies of any desired number of the SUPPLEMENT sent to one address on receipt of 10 cents.

Remit by postal order. Address
MUNN & CO., 37 Park Row, New York.

The Scientific American Supplement

is a distinct paper from the SCIENTIFIC AMERICAN. THE SUPPLEMENT is issued weekly. Every number contains 16 octavo pages, with handsome cover, uniform in size with SCIENTIFIC AMERICAN. Terms of subscription for SUPPLEMENT, $5.00 a year, postage paid, to subscribers. Single copies 10 cents. Sold by all news dealers throughout the country.

Combined Rates.—The SCIENTIFIC AMERICAN and SUPPLEMENT will be sent for one year, postage free, on receipt of *seven dollars*. Both papers to one address or different addresses, as desired.

The safest way to remit is by draft, postal order, or registered letter. Address MUNN & CO., 37 Park Row, N. Y.

Scientific American Export Edition.

The SCIENTIFIC AMERICAN Export Edition is a large and splendid periodical, issued once a month. Each number contains about one hundred large quarto pages, profusely illustrated, embracing: (1.) Most of the plates and pages of the four preceding weekly issues of the SCIENTIFIC AMERICAN, with its splendid engravings and valuable information; (2.) Commercial, trade, and manufacturing announcements of leading houses. Terms for Export Edition, $5.00 a year, sent prepaid to any part of the world. Single copies 50 cents. ☞ Manufacturers and others who desire to secure foreign trade may have large, and handsomely displayed announcements published in this edition at a very moderate cost.

The SCIENTIFIC AMERICAN Export Edition has a large guaranteed circulation in all commercial places throughout the world. Address MUNN & CO., 37 Park Row, New York.

VOL. XLI., No. 1. [NEW SERIES.] *Thirty-fifth Year.*

NEW YORK, SATURDAY, JULY 5, 1879.

Contents.

(Illustrated articles are marked with an asterisk.)

TABLE OF CONTENTS OF
THE SCIENTIFIC AMERICAN SUPPLEMENT
No. 188,
For the Week ending July 5, 1879.

Price 10 cents. For sale by all newsdealers.

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.

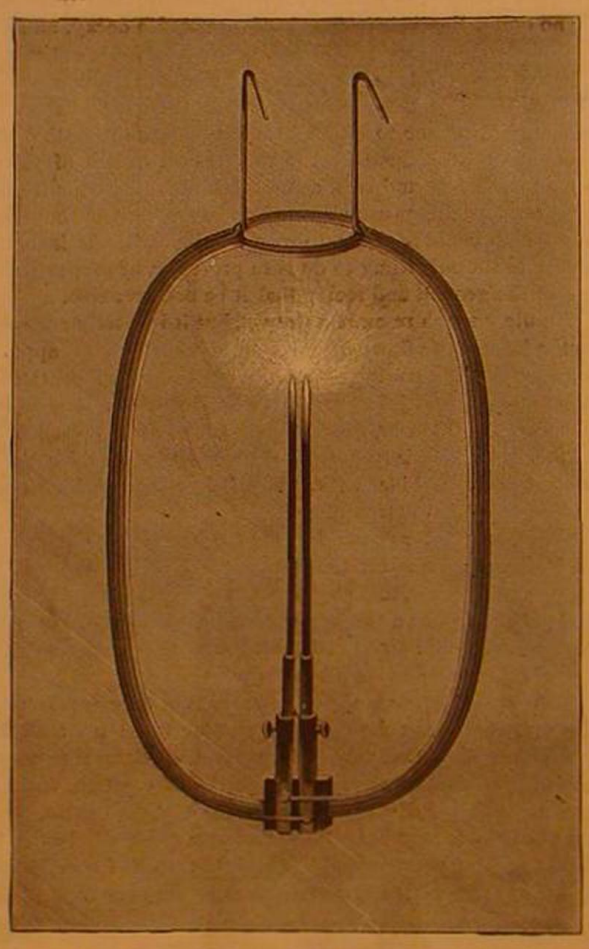
An improvement in refrigerators, patented by Mr. Joseph P. Ast, of Staunton, Va., which consists in combining with the outer case of the refrigerator and the ice box, a series of separated parallel strips, which give direction to the circulating currents and strengthen the ice box.

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.

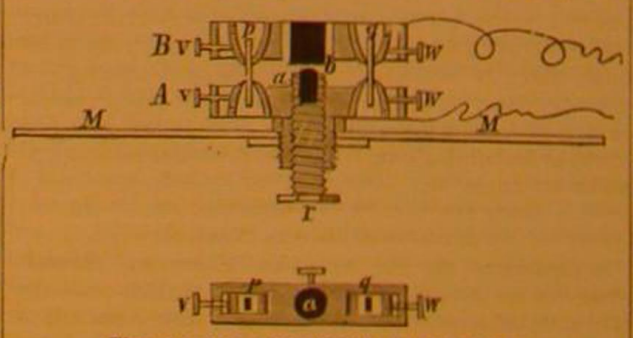
M. Jamin surrounds two nearly parallel carbon sticks with an elliptical coil of wire, through which passes the current which gives the light. This lamp is shown in the annexed engraving, which we take from *La Nature;* the coil, being in the same vertical plane as the carbon rods, is arranged so that 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.

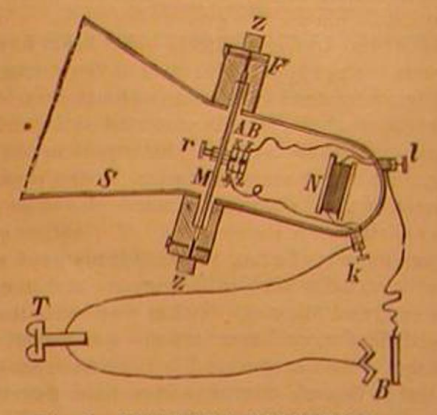


Fig. 3.—LUEDTGE'S TELEPHONE.

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.

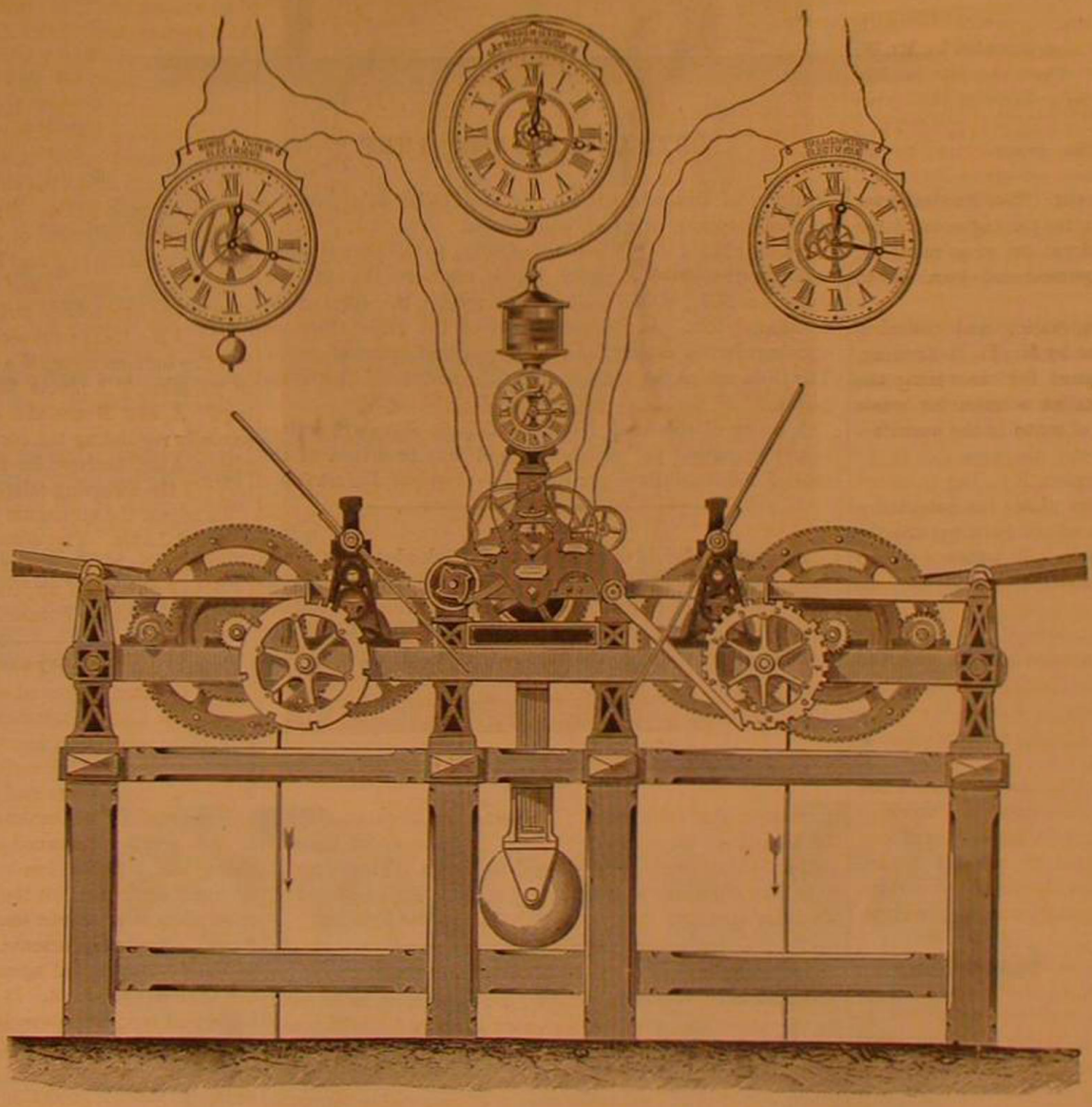
Dr. W. Gill Wylie, of this city, calls attention in the *Medical Record* to the value of hydriodic acid as a therapeutic agent in certain cases where the use of potassium iodide is indicated, but where the continued use of the latter would irritate the stomach and seriously interfere with digestion. 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.

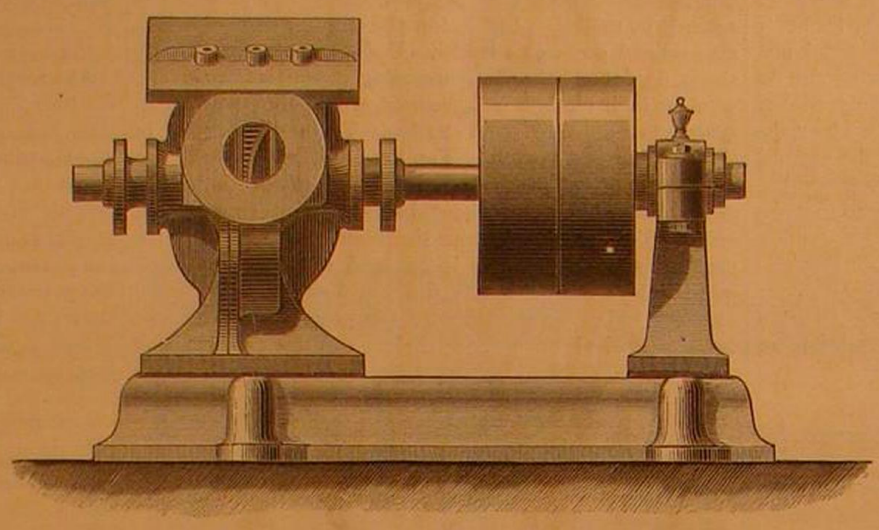
Mr. F. H. Purenton, of Brunswick, Me., has invented an improved sectional steam boiler, having a lower section or water chamber surrounding the fire chamber, and connected with an upper section by means of inclined pipes, the said upper section being provided with curved flues that communicate with the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



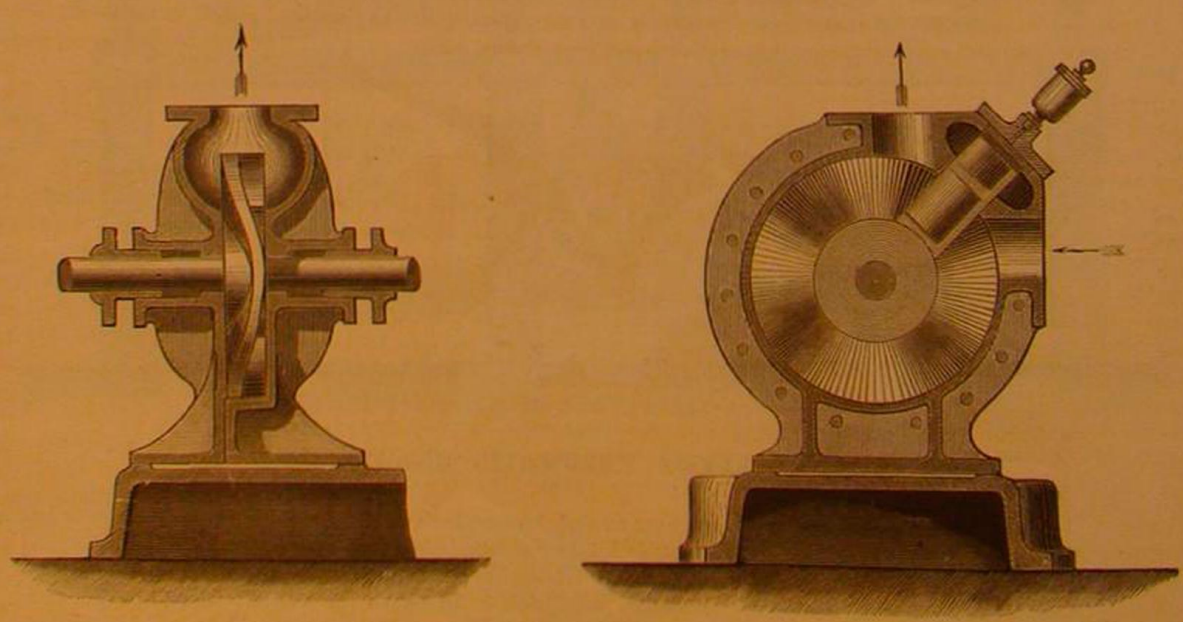
ORTMAN'S ROTARY PUMP.

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 (*euphorbia*), 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 scared 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.

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

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 (*Proc. totrupes 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.*

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

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 23.

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.

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.

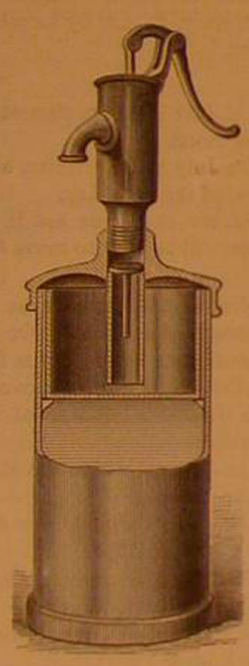
If the above statements are true, this may prove to be a rich find for our antiquarians.

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.

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. Labouillière 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.

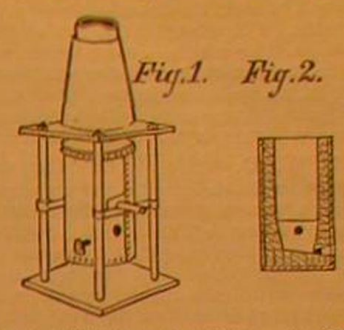
(12) D. F. writes: I read in one of your back numbers that if 14 grains of bichromate of potassium were dissolved in one ounce of gelatine and poured upon a ground glass plate, and dried in the dark, by placing a negative over the dried bichromate surface and exposing it to the rays of sunshine for a 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 0·7036, carbon disulphide 0·4122, bromine 0·3040, acetic ether 1·2184, hydrogen 0·2354, ammonia 0·2996. Specific gravity—ethylic ether +30°, 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 0·0688, 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 800 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 Calland batteries working a telegraph wire on a closed circuit and never cut out, be cleaned? A. The Calland 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 1000) 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, 2⅝ inches; rim, 5-16 inch square; diameter of magnet cores, ¾ inch; length of magnet cores, 1 inch; between centers of magnet cores, 1⅛ inch; width of armature, ⅛ 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 500 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.
On Ventilation. By C. J. B.
A Mechanic's Theory of the Solar System. By W. W.

[OFFICIAL.]

INDEX OF INVENTIONS

FOR WHICH

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

May 27, 1879,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

Amalgamator, I. M. Phelps ... 215,970
Auger, W. Heyn ... 215,744
Bag fastener, A. Gleason ... 215,736
Bale tie, A. Gates ... 215,909
Bale tie, J. S. Kennedy ... 215,755
Baling press, J. Wohl ... 215,854
Basin, wash, G. W. Dean ... 215,891
Basin cleaner, wash, J. L. Hutchinson ... 215,928
Bed, spring, C. T. Segar ... 215,981
Bedstead, wardrobe, E. E. Everitt ... 215,727
Billiard cue rest, T. Watson ... 215,848
Boot, C. H. Colburn ... 215,794
Boot and shoe heel plate, S. C. Swett ... 215,839
Boot and shoe toe stretcher, W. Nagle ... 215,959
Bottle cage, Williams & Greenwood ... 215,852
Bottle cork fastener, T. H. Shahan ... 215,838
Bracelet, self-adjusting, W. A. L. Miller ... 215,956
Braid package clasp, D. & D. L. Goff (r) ... 8,725
Bran packer, J. E. Belt ... 215,787
Brick, etc., burner, J. & C. J. Foster ... 215,904
Brick burning kiln, E. G. Kemper ... 215,906
Brick machine, T. B. Craycroft ... 215,886
Buckle, Welden & Royce ... 215,005
Buckle, trace, A. McMullen ... 215,829
Butter and egg package, S. Mchenry ... 215,953
Butter case, refrigerating, E. Slocum ... 215,984
Butter mould, W. S. Alexander ... 215,856
Butter package, W. W. Rodgers ... 215,775
Button and stud, C. G. Bloomer ... 215,868
Button card, J. Thornton ... 215,992
Calendar support, Pruyn & Hyatt ... 215,974
Candle, electric, J. B. Fuller ... 215,733
Carding machine cleaner, P. Hauser ... 215,920
Carpet fabric, W. Wallace ... 215,999
Carriage, child's, J. W. T. Huke ... 215,927
Caster, S. Vanstone ... 215,966
Casting hubs, mould for, V. Price ... 215,772
Casting ornamental figures, composition for, A. Kiesele ... 215,757
Chain, driving, G. Vickers ... 215,997
Chair leg tenoner, F. F. Parker ... 215,767
Chair seat and back, Heywood & Watkins ... 215,923
Churn, W. L. Allegree ... 215,857
Churn, M. R. Whelchel ... 215,850
Churn dasher, S. K. Warren ... 216,000
Cider mill, Marsh & Brandt ... 215,950
Cigar package, M. W. Prager ... 215,973
Clay grinder and mixer, J. M. Kennedy ... 215,754
Clocks, making wires and arbors of lock work for striking, F. A. Lane ... 215,759
Cocks, operating stop, P. Connolly ... 215,893
Coin assorter, A. S. Tyler ... 215,846
Coin package, W. V. Brigham ... 215,788
Copying press, W. L. Imlay ... 215,930
Cotton and hay press, J. K. Hawkins ... 215,817
Crochet needle, W. Ross ... 215,979
Cultivator, O. A. Crain ... 215,885
Cultivator, W. Jones ... 215,931
Curtain fixture, C. Cretors ... 215,809
Dental hand piece, H. D. Justi ... 215,932
Desk, A. De Bary ... 215,861
Desulphurizer, A. M. Phelps ... 215,971
Diamonds, mounting, L. Taverdon ... 215,840
Dish washer, L. Warren ... 216,001
Distilling petroleum, process and apparatus for, J. L. Kirk ... 215,755
Distiller, wood, A. Knobloch ... 215,940
Door check, J. P. Ellacott ... 215,900
Door sheave, rolling, J. H. Townsend ... 215,993
Doubling and winding machine, T. Unsworth ... 215,995
Easel, F. S. Frost ... 215,731
Eave trough, C. W. Haucke ... 215,740
Egg packing box, I. Karel ... 215,933
Electric lighter, Cointepas & Rouchel ... 215,722
Electrical switch wires to binding posts, attaching, J. E. Hamilton ... 215,917
Electroplater, H. & H. W. Lovejoy *et al* (r) ... 8,726
Envelope, A. Christey ... 215,793
Envelope or double postal card, L. H. Rogers ... 215,776
Fan, automatic, F. Rockenbach ... 215,978
Farm gate, W. Claypool ... 215,883
Farm gate, automatic, L. Ferguson ... 215,814
Farm gate support, S. G. Holyoke ... 215,925
Faucet joint, N. Spofford ... 215,997
Fence, J. W. Legore ... 215,825
Fence wires, machine for barbing, E. P. Peacock ... 215,769
Fencing, barb for wire, J. S. Crowell ... 215,888
Filter, E. W. Kidney ... 215,938
Firearm, G. W. Cilley ... 215,721
Fire escape, E. M. Ball ... 215,713
Flywheel, G. H. Corliss ... 215,805
Fruit drier, McDowell & Ewell ... 215,962
Furnace for reducing oxide ores, C. M. Dupuy ... 215,736
Galvanic battery solution, C. A. Ehrenberg ... 215,899
Garbage cremating furnace, W. J. Morris ... 215,957
Gas, apparatus for the production of illuminating, C. Marchand ... 215,949
Gas works, jet exhauster for, J. S. Connelly ... 215,723
Gate, J. A. Knickerbocker ... 215,758
Glass jar mould, J. N. Bodine ... 215,899
Glassware finisher, H. S. McKee ... 215,761
Glove, A. Harris ... 215,738
Grain conductor, J. F. Lenox ... 215,760
Grain drill fertilizer attachment, C. P. Bechtelle ... 215,864
Grain drill fertilizing attachment, D. F. Hull ... 215,748
Grain transferrer, J. T. Hough ... 215,818
Gridiron, J. M. Adams ... 215,711
Guard finger, J. O. Brown ... 215,789
Hame fastener, H. N. Beam ... 215,862
Harrow, S. F. Reynolds ... 215,975
Harrow, sulky, G. W. Riley ... 215,774
Harvester rake, C. Lidren (r) ... 8,727
Hats, ventilating, Waddell & Sample ... 215,998
Hay rack, C. Graham ... 215,914
Hay rake, horse, W. S. Archer ... 215,784
Hay rake, horse, W. C. Kingsnorth ... 215,939
Hay ricker and stacker, B. F. Jones ... 215,930
Hides, machine for ascertaining the area and weight of, D. T. Winter ... 215,853
Hoe, J. Gilmer ... 215,735
Holdback, vehicle, R. T. Barton ... 215,714
Hop pole puller, B. G. Chapman ... 215,720
Horse clothing, J. C. Simpson ... 215,983
Horse detacher, J. Carr ... 215,879
Horse detacher, R. H. Oakes ... 215,961
Horse detacher, W. H. Petree ... 215,965
Horseshoe, Moebs & Landschneider ... 216,764
Horseshoe nail forger, L. S. Parre ... 215,768
Hose coupling, car, F. Woodbridge ... 216,010
Hub, vehicle wheel, J. I. Healey ... 215,741
Hydraulic elevator, H. Snowden ... 215,985
Hydro-pneumatic engine, C. Fisher ... 215,902
Incense coal, compound for, E. W. J. Lindesmith ... 215,945
Injector, Fulton & Proeger ... 215,906
Injector and ejector, J. H. Irwin ... 215,821
Instrument case and dental engine, combined, B. M. Wilkerson ... 215,851
Invalid chair, adjustable, F. Bohsert ... 215,871
Knitting machines, knocking over bit for, W. D. Ormsby ... 215,963
Labels, pictures, etc., machine for varnishing, gumming, and sizing, J. T. Turner ... 215,845
Ladder hook, adjustable, D. P. Foster ... 215,729
Ladder, platform, A. J. Andrews ... 215,712
Lamp, E. Blackman ... 215,867
Lamp, E. M. Lowden (r) ... 8,729
Lamp attachment, L. W. Peck ... 215,964
Lamp bracket, H. R. Mills ... 215,955
Lamp chimney, C. L. & C. Bartholomew ... 215,785
Lamp chimney, globe, J. H. White ... 216,007
Lamp, electric, W. Gilman ... 215,910
Lamp shade, P. K. Guild ... 215,816
Lasting machine, Copeland & Woodward ... 215,796
Lathe, grinding, C. Fest ... 215,901
Lawn sprinkler and hose reel, E. L. Abbott ... 215,709
Levees, constructing, M. C. Lawton ... 215,943
Lifting handle, W. H. Hart ... 215,739
Line holder, J. J. W. Wilson ... 216,008
Load binder, Holler & McDaniel ... 215,746
Mail bag dropper, Brauchler & Sindorf ... 215,873
Mashing grain, apparatus for, J. A. Eberhardt ... 215,811
Mash tub, G. Young ... 216,011
Measure and funnel, G. W. Shaw ... 215,982
Mechanical movement, T. W. Eaton ... 215,810
Mechanical movement, C. Tyson ... 215,778
Metal bar reducer, G. J. Capewell ... 215,719
Metal shearing machine, C. A. & J. K. Williams ... 215,720
Microscope, W. H. Bulloch ... 215,878
Milk cooler, Ford & Butler ... 215,903
Milk pan, C. C. Fairlamb ... 215,812
Milk setter, F. G. Butler (r) ... 8,724
Moth proof fur case, C. M. Parker ... 215,835
Motion converter, R. P. Bowdoin ... 215,872
Mowing and reaping machine, G. O. S. Conway ... 215,724
Musical instrument, mechanical, E. P. Needham ... 215,831
Nut lock, G. W. Rhines ... 215,836
Nut lock, J. D. Van Benthuysen ... 215,779
Oil, etc., can for, J. D. Pierce ... 215,771
Oils for illumination, heavy hydrocarbon, R. S. Merrill (r) ... 8,728
Ore pulverizer, I. M. Phelps ... 215,966, 215,967
Ore pulverizer and separator, A. Goodhart ... 215,912
Ore roaster, revolving, D. W. Brunton ... 215,877
Organs, pedal attachment for reed, G. B. Kelly ... 215,822
Orrery, A. Mang ... 215,948
Oven, domestic, J. Watson ... 216,003
Pails, removable cover or front for, Mayo & Atkinson ... 215,838
Paper box cover machine, M. F. Wilson ... 216,009
Paper machines, automatic feed for, J. T. F. MacDonnell ... 215,946
Paper pulp from wood, making, W. E. Farrell ... 215,728
Paper vessel, W. C. Ritchie ... 215,976
Pen, fountain, L. W. Fairchild ... 215,813
Pen, fountain, G. Wells ... 216,004
Pianoforte action, G. O. V. Roedern ... 215,977
Picture, A. F. Craig ... 215,725
Pitman connection and crank pin, D. H. Cooper ... 215,795
Plaiting machine, J. H. Brown ... 215,790
Planter, corn, W. W. Goodwin ... 215,913
Planter, corn, Taylor & Rice ... 215,991
Plaster and pad, R. M. Kennedy ... 215,937
Plow, E. O. Beach ... 215,715
Plow, sulky, T. E. Jefferson ... 215,929
Plows or harrows, farm truck or draught attachment for, M. Harris ... 215,918
Polisher, tumbling, J. W. Hyatt ... 215,751
Porcelain, box and cover for firing decorated, E. M. Ford ... 215,815
Post driver, W. A. Newton ... 215,832
Printing, autographic, W. T. Howard ... 215,926
Printing machine sheet deliverer, S. D. Tucker ... 215,844
Printing surfaces, embossing metal for, A. C. & G. R Carey ... 215,792
Propulsion of vessels, pneumatic, R. H. Tucker ... 215,842
Puddling furnace, I. Beanland ... 215,863
Pulp, making wood, C. B. Carter ... 215,890
Pump, C. G. Grove ... 215,737
Pump plunger, G. H. Corliss ... 215,801
Pump, submerged, J. M. May ... 215,951
Pump valve, G. H. Corliss ... 215,800
Pumping engine, steam, G. H. Corliss ... 215,802
Pumping engine, G. H. Corliss ... 215,803, 215,804
Punch, leather cutting, B. Bohonon ... 215,870
Quarts crusher, I. M. Phelps ... 215,968
Radiator, steam, J. T. Kelly ... 215,823
Rail joint, E. P. Hyatt ... 215,819
Railway switch, S. B. Nickum ... 215,960
Railway track, portable, M. Pesant ... 215,770
Refrigerator, J. P. Ast ... 215,859
Ribbon clasp or clip, C. C. G. Hubert ... 215,747
Rivet, tubular, B. L. D'Aubigne ... 215,889
Roll for forming metal articles, G. J. Capewell ... 215,718
Roller and pulverizer, G. Meding ... 215,954
Roofing, metallic, L. Struble ... 215,999
Rotary engine, R. Campbell ... 215,717
Sad iron, Williams & Warren ... 215,781
Sad iron and fluting roller, C. J. Kramer ... 215,941
Saddle tree, gig, J. B. Gathright ... 215,734
Sauce, making solidified, J. A. Liebert ... 215,944
Sash fastener, F. R. Glascock ... 215,911
Sawing box stuff, machine for, J. Du Bois ... 215,897
Sawing machine, drag, J. K. Alters ... 215,856
Scale beam, J. R. Linen ... 215,939
Sewer gas stopper, C. Y. Wemple ... 216,006
Sewer pipe, P. McMackin ... 215,947
Sewing machine, J. A. True ... 215,841
Shade supporter, S. H. Miller ... 215,763
Shafting coupler, W. T. McMasters ... 215,762
Sheet metal can seam, E. Norton ... 215,766
Shingle bolts, mill for sawing, J. Du Bois ... 215,898
Ship's hull, R. H. Tucker ... 215,994
Shirt front or dickey, G. C. Henning ... 215,743
Shoe clasp, King & Hammond ... 215,824
Shoes, button hole for, W. F. Hill ... 215,745
Sickle, etc., holder, H. E. Fuller ... 215,732
Sink valve, Crossman & Somes ... 215,897
Skate, roller, L. B. Jackson, Jr ... 215,752
Skid, W. H. Douty ... 215,895
Sled, R. T. Ogden ... 215,967
Sled propeller, R. Steel ... 215,988
Smoke and dust excluder, J. E. Driesbach ... 215,896
Snow plow, J. M. Baldwin ... 215,860
Spinning machine spindle, D. Kelley ... 215,935
Spooling guide, C Sullivan ... 215,990
Spools, thread fastening on, W. E. Barrows ... 215,786
Stall for vessels, cattle, B. Albee ... 215,855
Stamp, canceling and dating, W. J. Blackwell ... 215,866
Stamp mill cam, J. Scott ... 215,980
Steam boiler, tubular, G. H. Corliss ... 215,598
Steam engine beam, G. H. Corliss ... 215,808
Steam engine, compound, G. H. Corliss ... 215,799
Steam engine cylinder, G. H. Corliss ... 215,807
Steam generator, M. J O'Rielly ... 215,834
Steamer and drier, grain, L. Hartson ... 215,919
Stencils, producing autographic, S. S. Nickerson ... 215,833
Stirrup, saddle, P. A. De La Nux ... 215,942
Stool, D. B. Reynolds ... 215,773
Stove, cooking, J. B. Long ... 215,827
Stove, heating, J. P. Clark ... 215,881
Stove, heating, M. Helbling ... 215,742
Stoves, long center and reservoir cover for, S. R. Burton *et al* ... 215,716
Straw cutter, J. Dick, Jr ... 215,894
Sublimating apparatus, I. M. Phelps ... 215,909
Surf boat, R. H. Tucker ... 215,843
Surveying instrument, I. Humphrey ... 215,749
Swine holder, W. L. Pitts ... 215,972
Tag fastener, F. Morris ... 215,765
Tapping pipe fittings, machine for, D. Ackerman ... 215,710
Teaching arithmetic, device for, S. P. Halleck ... 215,916
Teeth, artificial, J. W. Holt ... 215,924
Telephone switch, H. L. Roosevelt ... 215,837
Tether, Fox & Cottrell ... 215,730
Thill coupling, H. F. Gaines ... 215,907
Thill coupling, R. W. Hawes ... 215,921
Thrust block, J. S. Wilson ... 215,782
Tile moulding for holding tiles, C. A. Wellington ... 215,849
Time lock, T. Shaw ... 215,777
Toy pistol, J. M. Keep ... 215,934
Tumbling rod knuckle, C. Q. Hayes ... 215,922
Umbrella frame, J. Miniere ... 215,830
Valve gear, steam engine, G. H. Corliss ... 215,797, 215,884
Valve, steam engine exhaust, G. H. Corliss ... 215,806
Vapor burner, Z. Davis ... 215,810
Vehicle dashboard, B. J. Warden ... 216,002
Vehicle spring, Spalding & Wiede ... 215,986
Velocipede, J. E. Browne ... 215,878
Veneer sander and smoother, W. Gariner ... 215,908
Vent, automatic air, J. P. Gruber ... 215,915
Ventilator, G. R. Buffham ... 215,791
Ventilator, L. J. Wing ... 215,783
Wagon, beer, J. G. Unseeld ... 215,847
Wagon, buck board, R. A. Morse ... 215,958
Wash board, F. Freligh ... 215,905
Weather strip, I. Bennett ... 215,865
Weather strip, H. L. Hyre ... 215,750
Wind engine, J. W. Kelsey ... 215,753
Windmill, J. Desjardins ... 215,892
Wire drawing, lubricating material for use in, A. B. Brown ... 215,875
Yoke coupling for vehicles, neck, S. Brown ... 215,874

TRADE MARKS.

Capsuled medicine, S. Limousin ... 7,371
Cigars, cigarettes, smoking and chewing tobacco, Goodwin & Co ... 7,370
Cigars, cigarettes, smoking and chewing tobacco, and snuff, H. Welsh ... 7,357
Cigars, cigarettes, and smoking tobacco, Straiton & Storm ... 7,353, 7,354, 7,364
Dyspepsia cure, J. C. D. Curtiss ... 7,369
Fertilizing compositions or compounds, The Chesapeake Guano Company ... 7,355
Flour, Rolston, Hall & Co ... 7,367
Flour, Thomas & Co ... 7,375
Kerosene oil, R. W. Forbes ... 7,373
Lard, W. J. Wilcox & Co ... 7,368
Laundry soap, Allison Brothers ... 7,372
Liniment, F. F. Braillard ... 7,362
Lotions for the skin and hair, A. A. Heaton ... 7,361
Petroleum for illuminating and lubricating purposes, Mather Brothers ... 7,352
Pills for cure of chills and fever, W. W. Brownfield ... 7,365
Preparation of corn starch, A. Erkenbrecher ... 7,359
Smoking tobacco, J. R. Day & Bro ... 7,351
Starch for laundry use, A. Erkenbrecher ... 7,358, 7,360
Skirt braid, S. B. & M. Fielsher ... 7,366
Troches or lozenges, Hall & Hodgman ... 7,374
Wax or mining candles, W. T. Coleman & Co ... 7,363
Wood barrels, kegs, well buckets, and pails, J. F. Vogt & Bro ... 7,356

DESIGNS.

Billiard table, H. W. Collender ... 11,209, 11,210
Carpet, W. McCallum ... 11,214
Combined rose and escutcheon, G. S. Barkentin ... 11,213
Dish handle, S. Stevens ... 11,207
Door knob, G. S. Barkentin ... 11,205
Gimp, J. H. Thorp ... 11,215
Handles of spoons and forks, W. C. Beattie ... 11,212
Ornamental chain, W. T. Chamberlain ... 11,211
Rubber mats, G. Woffenden ... 11,208
Stands for sad irons, etc., L. & W. H. Berger ... 11,206

English Patents Issued to Americans.

From May 30 to June 3, inclusive.

Filtering machine, G. C. W. Belcher, St. Louis, Mo.
Gas burner attachment, W. W. Bachelder, N. Y. city.
Grain binders, F. Randall, ——, Mich.
Tramway cars, J. Stephenson, New York city.

THE FOSSIL FORESTS OF THE YELLOWSTONE NATIONAL PARK. By W. H. Holmes. A very interesting and valuable paper descriptive of the remarkable "Volcanic Tertiary" formations of the above region, 5,500 feet in thickness. Illustrated by an engraving of the north face of Amethyst mountain, 9,400 ft. high, the river bed 6,500 ft. high, showing the position of the multitudes of ancient forest tree trunks of gigantic size, turned into stone and now standing on the cliffs, together with many other interesting geological particulars. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 180. Price 10 cents. To be had at this office and of all newsdealers.

SCIENTIFIC AMERICAN SUPPLEMENT. Any desired back number of the SCIENTIFIC AMERICAN SUPPLEMENT can be had at this office for 10 cents. May also be had or ordered through booksellers and newsdealers everywhere. MUNN & CO., Publishers, 37 Park Row, New York.

OF THE

Scientific American

FOR 1879.

The Most Popular Scientific Paper in the World.

VOLUME XL.—NEW SERIES.

The publishers of the SCIENTIFIC AMERICAN beg to announce that on the Fourth day of January, 1879, a new volume will be commenced. It will continue to be the aim of the publishers to render the contents of the new volume as, or more, attractive and useful than any of its predecessors.

Only $3.20 a Year including Postage. Weekly. 52 Numbers a Year.

This widely circulated and splendidly illustrated paper is published weekly. Every number contains sixteen pages of useful information, and a large number of original engravings of new inventions and discoveries, representing Engineering Works, Steam Machinery, New Inventions, Novelties in Mechanics, Manufactures, Chemistry, Electricity, Telegraphy, Photography, Architecture, Agriculture, Horticulture, Natural History, etc.

All Classes of Readers find in THE SCIENTIFIC AMERICAN a popular resume of the best scientific information of the day; and it is the aim of the publishers to present it in an attractive form, avoiding as much as possible abstruse terms. To every intelligent mind, this journal affords a constant supply of instructive reading. It is promotive of knowledge and progress in every community where it circulates.

Terms of Subscription.—One copy of THE SCIENTIFIC AMERICAN will be sent for *one year*—52 numbers—postage prepaid, to any subscriber in the United States or Canada, on receipt of **three dollars and twenty cents** by the publishers; six months, $1.60; three months, $1.00.

Clubs.—One extra copy of THE SCIENTIFIC AMERICAN will be supplied gratis *for every club of five subscribers* at $3.20 each; additional copies at same proportionate rate. Postage prepaid.

One copy of THE SCIENTIFIC AMERICAN and one copy of THE SCIENTIFIC AMERICAN SUPPLEMENT will be sent for one year, postage prepaid, to any subscriber in the United States or Canada, on receipt of *seven dollars* by the publishers.

The safest way to remit is by Postal Order, Draft, or Express. Money carefully placed inside of envelopes, securely sealed, and correctly addressed, seldom goes astray, but is at the sender's risk. Address all letters and make all orders, drafts, etc., payable to

MUNN & CO.,
37 Park Row, New York.

To Foreign Subscribers.—Under the facilities of the Postal Union, the SCIENTIFIC AMERICAN is now sent by post direct from New York, with regularity, to subscribers in Great Britain, India, Australia, and all other British colonies; to France, Austria, Belgium, Germany, Russia, and all other European States; Japan, Brazil, Mexico, and all States of Central and South America. Terms, when sent to foreign countries, Canada excepted, $4, gold, for SCIENTIFIC AMERICAN, 1 year; $9, gold, for both SCIENTIFIC AMERICAN and SUPPLEMENT for 1 year. This includes postage, which we pay. Remit by postal order or draft to order of Munn & Co., 37 Park Row, New York.

Advertisements.

Inside Page, each insertion - - - 75 cents a line.
Back Page, each insertion - - - $1.00 a line.
(About eight words to a line.)

Engravings may head advertisements at the same rate per line, by measurement, as the letter press. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

SCIENTIFIC AMERICAN

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

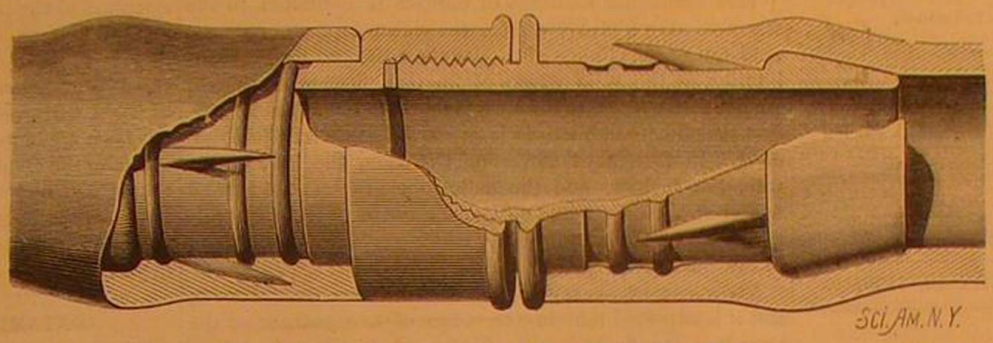
Vol. XLI.—No. 2. [NEW SERIES.] NEW YORK, JULY 12 1879. [$3.20 per Annum. [POSTAGE PREPAID.]

IMPROVED HOSE COUPLING.

The accompanying engraving illustrates a simple and effective device for quickly attaching hose to a coupling. It consists mainly in the inclined spurs which are located at different points in the circumference, but the two circumferential ribs and the conical end assist in holding the hose and insure a tight joint. To attach the hose to the coupling it is only necessary to slip it over the conical end and over the hooks, when it will be retained more securely than by the ordinary devices heretofore used for this purpose.

This contrivance is the invention of Mr. William F. Hofmann, of No. 1232 Thompson street, Philadelphia, Pa.

Communications in reference to the above should be addressed to Charles M. Ghriskey, 508 Commerce street, Philadelphia, Pa.



HOFMANN'S HOSE COUPLING

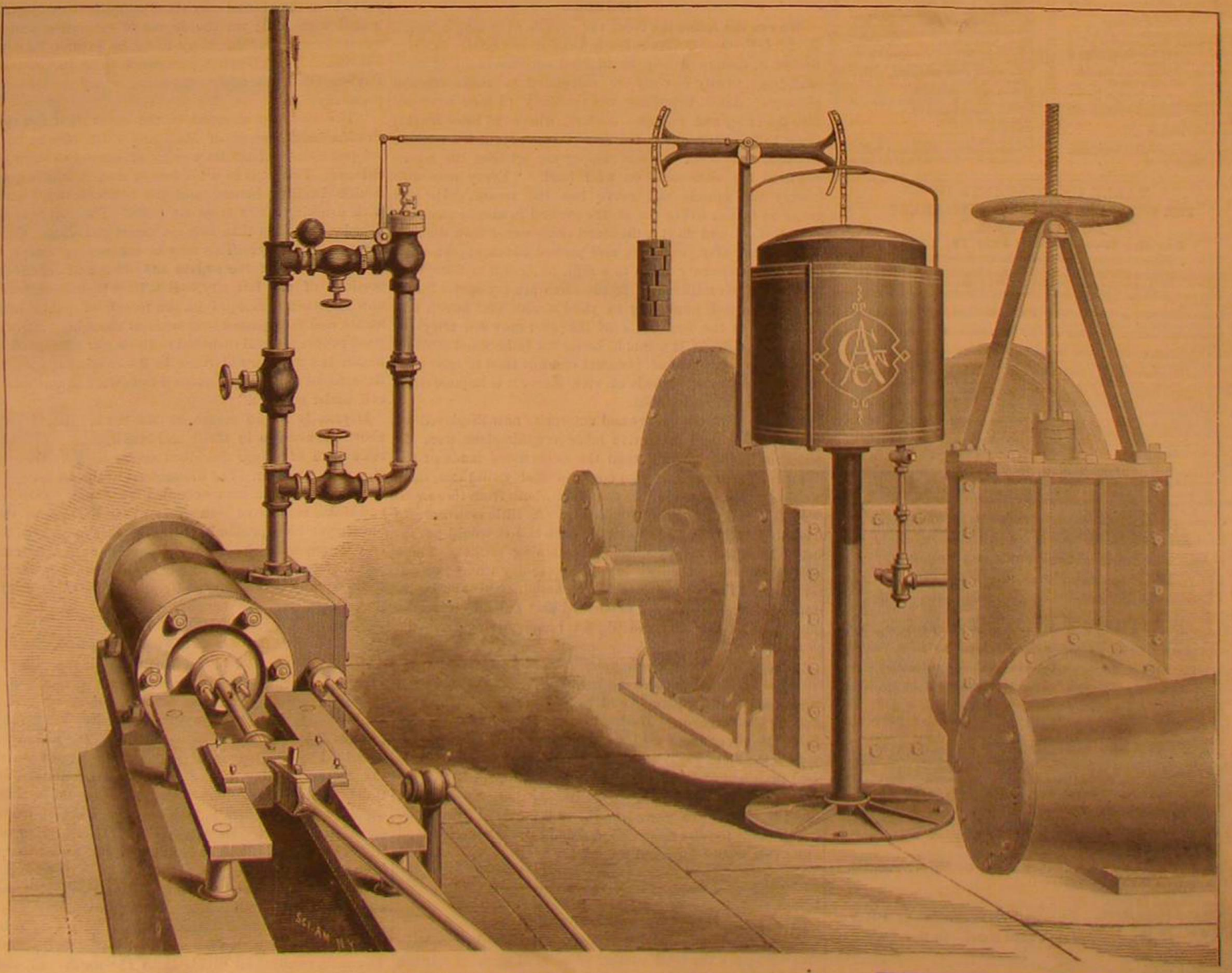
A NEW GAS EXHAUSTER GOVERNOR.

We give on this page an illustration of the Allen governor as applied to the large works of the Gaslight Co., in Boston, Mass. The office of governors of ordinary steam engines is to give a regular speed at varying steam pressure and with changing work. With exhauster engines the case is entirely different: the speed will be irregular, and must vary according to the pressure of the gas. Until recently no one has succeeded in accomplishing this, and the work has practically been done by hand, an engineer being always near by to increase or diminish the speed, according as the pencil on the indicator, or the fluid in the tube, shows the pressure to be greater or less.

A tank about two feet in diameter standing upon a column is placed in a suitable position and at a convenient distance from the engine. Elevated upon one side of this is a nicely adjusted beam with sector ends, one of which is connected by a chain with the inverted cup or gas holder, and the other with weights sufficient to balance it. There is a perforated diaphragm with adjustable apertures across the bottom of the gas holder, which prevents too great movements or changes, and checks the oscillations. A small steel or brass rod runs from an adjustable crank fitted into a slotted trunnion in the center of the beam to another lever connected with a patent Allen balance valve in the steam supply pipe. The tank is partly filled with water to seal the gas. A pipe from the hydraulic main, or in some instances connected with the pipe back of the exhauster, comes up through the bottom of the tank, opening above the water, thus forming a small gas holder within which the pressure is always the same as in the main. Of course the varying pressure causes the bell to rise and fall, and instantly affects the governor valve, causing the engine to go faster or slower, as desired. In practice it is found to give a steadier pressure (the variation rarely exceeding one tenth) than it is possible for a man to do if standing by the engine constantly. The bypath in the steam pipe was put in to prevent possible delays. It has never been used except in the Boston works.

When these governors are used the engineer is not required to be present except to oil his machinery. The saving by keeping the pressure even, to say nothing of the engineer's time, will be great, and will vary, of course, with the amount of gas made. The bell travels about ten inches to open the valve, and works the same in all positions. When once properly adjusted this governor controls the engine perfectly at any pressure of steam sufficient to do the work and with any amount of gas. This governor, which is the invention of R. K. Huntoon, is secured by several patents, and is sold at a reasonable price. They are now in successful operation in the works of the gas companies at Boston, Lowell, Cambridge, Springfield, Brookline, Lawrence, Rochester, N. Y.; Providence, R. I.; Newport, R. I.; Pittsburg, Pa.; Buffalo, N. Y.; and many other cities.

Further information may be obtained by addressing the American Meter Company, Arch street, Philadelphia, or the Allen Governor Company, Boston, Mass.



THE ALLEN GAS EXHAUSTER GOVERNOR.

Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT
NO. 37 PARK ROW, NEW YORK.

O. D. MUNN. A. E. BEACH.

TERMS FOR THE SCIENTIFIC AMERICAN.

One copy one year, postage included $3 20
One copy, six months, postage included 1 60

Clubs.—One extra copy of THE SCIENTIFIC AMERICAN will be supplied gratis for every club of five subscribers at $3.20 each; additional copies at same proportionate rate. Postage prepaid.

☞ Single copies of any desired number of the SUPPLEMENT sent to one address on receipt of 10 cents.
Remit by postal order. Address
MUNN & CO., 37 Park Row, New York.

The Scientific American Supplement

is a distinct paper from the SCIENTIFIC AMERICAN. THE SUPPLEMENT is issued weekly. Every number contains 16 octavo pages, with handsome cover uniform in size with SCIENTIFIC AMERICAN. Terms of subscription for SUPPLEMENT, $5.00 a year, postage paid, to subscribers. Single copies 10 cents. Sold by all news dealers throughout the country.

Combined Rates.—The SCIENTIFIC AMERICAN and SUPPLEMENT will be sent for one year, postage free, on receipt of *seven dollars*. Both papers to one address or different addresses, as desired.
The safest way to remit is by draft, postal order, or registered letter Address MUNN & CO., 37 Park Row, N. Y.

Scientific American Export Edition.

The SCIENTIFIC AMERICAN Export Edition is a large and splendid periodical, issued once a month. Each number contains about one hundred large quarto pages, profusely illustrated, embracing: (1.) Most of the plates and pages of the four preceding weekly issues of the SCIENTIFIC AMERICAN, with its splendid engravings and valuable information; (2.) Commercial, trade, and manufacturing announcements of leading houses. Terms for Export Edition, $5.00 a year, sent prepaid to any part of the world. Single copies 50 cents. ☞ Manufacturers and others who desire to secure foreign trade may have large, and handsomely displayed announcements published in this edition at a very moderate cost.
The SCIENTIFIC AMERICAN Export Edition has a large guaranteed circulation in all commercial places throughout the world. Address MUNN & CO., 37 Park Row, New York.

VOL. XLI., No. 2. [NEW SERIES.] *Thirty-fifth Year.*

NEW YORK, SATURDAY, JULY 12, 1879.

Contents.

(Illustrated articles are marked with an asterisk.)

TABLE OF CONTENTS OF
THE SCIENTIFIC AMERICAN SUPPLEMENT
No. 184,
For the Week ending July 12, 1879.
Price 10 cents. For sale by all newsdealers.

THE NORTH-NORTHWEST.

The development of the great wheat region northwest of Minnesota has wrought a wonderful change in our notions of the climatic conditions of the far northwest. If Governor Couchon, of Manitoba, is correctly reported, there is yet to be made a still more remarkable change of opinion with regard to the country further north, and popularly considered a howling wilderness, with a climate of almost arctic severity.

Speaking of the course of the Canada Pacific Railroad west of Selkirk, at the southern end of Lake Winnipeg, Governor Couchon said that a mistake had been made in laying out the road too far south. Starting at Selkirk, near the 50° of latitude, it had been proposed to run the road north of Lake Manitoba, thence along the North Saskatchewan to Edmonton, on the fifty-third parallel, thence southwest to Victoria. Edmonton, however, proves to be one hundred miles too far south. The climate is milder in the belt of country from two to six degrees further north, around the Peace and Athabasca rivers. Indeed, it is very much warmer around Great Slave Lake than it is at Winnipeg, it being possible to raise wheat, barley, and Indian corn in that region.

This surprising mildness of climate is attributed to the warm winds which blow from the warm Japanese current, moderating the climate of the Pacific coast and the northern interior, as the mild winds of the Gulf Stream do that of England and Western Europe. Owing to the Japanese current the climate of Victoria is as warm as that of San Francisco. In fact, says Governor Couchon, the chromatilla rose, the fuchsia, and the heliotrope grow out doors all winter at Victoria, while on Peace river, between the parallels of fifty-five and fifty-nine, wheat grows weighing 68 lb. to the bushel.

A caravan of surveyors started for Peace river, June 3, and it is expected that in the course of five years or so the Canadian Pacific Railroad will be able to carry American settlers that way almost as far as Alaska. Of the 385 miles of road from Thunder Bay, Lake Superior, to Selkirk, but 175 miles remain to be laid, and 3,000 men are now at work on it. It is to be finished in the spring of 1881, when Winnipeg and Manitoba will have an outlet to Lake Superior. The line through the Red River valley, from Selkirk to St. Vincent, on the border of Minnesota, is already finished.

It is due to the reader to add that Governor Couchon's reporter is the well known correspondent of the New York *Sun*, Eli Perkins.

PLUCK AND ENERGY SUFFICIENT CAPITAL FOR PIONEERS.

We cut the following from the middle of a long editorial in the *Inter-Ocean*. There is truth and sound advice in every line of it, though it may be doubted whether many of those who cling to city poverty are calculated to make efficient pioneers. After bewailing the tendency of men to crowd into the cities and business centers, where the labor market is apt to be overstocked, the *Inter-Ocean* says it is a mistake to think that men without money are without the means required for settlement on wild land. "Every man with energy and muscle and nerve has the means. He can make an honest living out of the ground in almost any part of the West, and do it a thousand times easier than the men who planted fifty years ago, and packed a sack of corn upon the shoulder twenty miles to a mill, or beat it to flour with a pestle. The millions of fertile acres are crying for hands to turn the sod, promising to yield wealth and health and happiness to the occupants of the over-crowded alleys of towns and cities. It would be better for fathers and mothers to make any sacrifice of personal comfort than to raise children in these rank hotbeds of vice, where it is impossible to protect them from its taint.

"If one half the energy and enterprise now displayed by labor unions and protective labor organizations were directed to finding homes upon the unoccupied lands of the West for the thousands who could profitably till them, there would be less occasion for complaint, both from those who would go and those who would stay. A little assistance to enable deserving persons to secure such homes would pay far better than the money spent in sustaining strikes. There are a great many families in Chicago to-day whose best interests would be served, and whose happiness would be increased, if they could be persuaded and aided to leave the busy hum of the city and dig an honest living from the ground.

"There is room enough yet. According to the reports from the Land Office there are 724,311,477 acres of surveyed lands ready for occupants, and nearly twice as much more waiting the surveyor. During the ten years which closed in June, the government sold for cash 57,666,970 acres of land, besides the large grant to homesteaders. If the many hundred thousands who have, with hardship, opened up their new homes, could give their testimony, but few of them could be induced to move into the stifled air of our cities, and attempt to raise their children amid the temptations and vices that would surround them."

Rapid Transit in New York.

According to an official statement of the Manhattan Railway Company the total number of miles of elevated railway now in operation or in process of construction in New York are: Of the New York Elevated Railroad Company, 16 8-10 miles of double track; of the Metropolitan Elevated Railway Company, 24 3-10 miles of double track, of joint line of the New York and Metropolitan Companies, 2 6-10 miles of double track; total, 43 7 10 miles of double track.

The proposed lines in the newly acquired wards in Westchester County, north of Harlem River, would double the total above given. The proposed line through Fourth Avenue and the streets between its southern end and City Hall meets with as little favor from the Mayor as from the public generally, the prevailing opinion being that the city cannot afford to allow Mr. Vanderbilt thus to retrieve at public cost the blunder made in refusing to build a rapid transit road through the center of the island twelve years ago.

The Australian Exhibition.

Information has been received at the Department of State that the period for receiving applications for space in the International Exhibition at Melbourne has been extended to October 31, 1879.

The American Consular representatives in Australia have been instructed by the State Department to pay particular attention to the interests of American exhibitors at Sydney and Melbourne. To represent the United States directly there will be a Secretary or executive officer and two or three Commissioners. The Secretary will have general charge of the American department. Dr. C. C. Cox, of this city, has been appointed to that position. No transportation of goods to the Exhibition will be at the expense of the United States, and no government vessels will be sent with goods. Dr. Cox will open an office in the Department of State to make arrangements and transact business preliminary to his departure.

CONTAMINATION OF DRINKING WATER.

The investigations of the British Health Commissioners discovered that in scarcely one of the beautiful old towns that so delight the traveler in England, was it possible to find a well that was not a source of sanitary peril. The older the town the more thoroughly the soil had become saturated with filth, and the greater the probability of the direct contamination of the drinking water by leakage from privy vaults. The frequency and fatality of typhoid and other epidemics due to filth-contaminated water in some of the most beautiful and, above ground, salubrious towns, gave them a death rate that was simply appalling; yet the inhabitants could scarcely be made to believe that the sparkling water of their wells was little less than deadly

In this country closely built towns are scarcely old enough yet to have the ground they stand on quite so completely saturated with filth; yet the degree of saturation and consequent danger may in many cases be greater than people imagine. The following paragraph from the *Journal*, of Dayton, Ohio, is terribly suggestive, to say the least. That paper says:

"The workmen engaged in the excavation for the new Pruden block, corner of Main and Fifth streets, have developed a state of affairs worthy of serious thought by our citizens. The lot is 99 x 157 feet in size, on which were five double dwelling houses, and the residents were supplied with drinking water from six wells. The soil was embellished with no less than fifty-six vaults and sinks. Can comment be necessary? This may be taken as a sample of the filth saturation of the soil in the older and more compact portions of our fair city. But these conditions are only now and then developed in the march of public improvements, and then passed over without thought. Many of our good people are still disposed to think our efficient board of health is a visionary alarmist in its continued warnings to the citizens and the city council to beware of this monstrous evil under our feet."

Dayton is by no means an old town. Its citizens are above the average in thrift and intelligence. Yet this horrible state of things described seems to have been left to chance to discover. The dimensions of the lot are evidently understated. The area occupied by houses, wells, vaults, and sinks, must have been greater than the area of the new block; yet their proximity to each other must have been at best dangerously close. And there is too much reason to fear that in other towns supplied with drinking water from wells equally disgusting and equally dangerous conditions prevail.

PAH-GOSA SPRINGS, COLORADO.

Beautifully located in the finest part of the valley of the San Juan river, below its rugged mountain course, and just above its entering an inaccessible cañon of cretaceous sandstone, is the great natural curiosity known by the Indians as Pah-Gosa, or Boiling Water. The main spring is described by Lieutenant McCauley as the largest as well as the hottest boiling spring in the United States. Indian trails from all directions converge upon the springs, all deeply worn, the place having been from time immemorial one of great resort. Here, attracted by the healing properties of the water, different families, bands, and tribes, have been accustomed to peacefully assemble, conceiving the springs to be a special creation of the great spirit for the cure of the sick of all tribes, however afflicted.

In the neighborhood of the springs the river is a beautiful trout stream, with a fall of about fifty feet to the mile. The main continental divide is to the north and east, approximating the arc of a circle, with Pah-Gosa as its center,

A spur of the Snowy Range, or Great Divide, separating the waters of the San Juan and Piedra tributaries, passes to the Southwest, terminating in Pah-Gosa peak, 12,670 feet high—a clearly defined pyramid from the south, and the most prominent point in the landscape. The springs lie on the shortest line of communication from the east to the lower San Juan country. The wagon road from Tierra Amarilla, North Mexico, to the Animas region, passes by them, and though not the shortest route, is the one most traveled, since it alone abounds in wood, water, and grass. It is mainly along the route of the old Spanish trail, the great highway in olden times, leading from New Mexico to the Animas.

The principal springs lie upon the east side of the river in a contracted valley or park, a short distance above where the Animas road crosses the river. They are nineteen in number, and have a temperature above blood heat. They lie in an angle made by a sharp bend in the river and upon its left bank. On the opposite side, half a mile or more to the south, is a group of cold springs near the river. Less than half a mile down the river a small creek flows in from the east, the Ojo Frio, so called from the number of cold springs along its banks. Just below its mouth sharp mesas and masses of vertical cretaceous rocks with wooded summits close in upon the river, forming a cañon not yet explored. The river is well stocked with trout and other fish.

The geological age of the springs is very great. Dr. Newberry is of the opinion that the main spring lies in the crater of an ancient volcano. Originally the mass of rising water had only a surface outlet, pouring forth over the sides of the orifice. The mineral matter which the hot water held in solution was deposited over the surface in thin sheets, forming a great mound mainly of calcium carbonate and sodium sulphate, of greatest thickness near the spring. About the main spring the mass of stalagmitic rock is honeycombed and cavernous, especially on the north toward the river. The entire group of hot springs occupies an area of about 21 acres, on the central and higher portion of the great mound.

The opening of the main spring is an irregular pear shaped depression about 70 feet long by 45 feet wide, the depth being immeasurable, owing to the stalagmitic obstructions beneath the surface. Columns of bubbles rise constantly everywhere over the surface, giving the spring the appearance of a huge glass of freshly decanted champagne. The great basin is divided by a partition capped with a cone of sulphur, from which spurts and puffs a tiny jet of water. Near the center the water boils furiously. The ebullition, however, is wholly gaseous, the water having a temperature below the boiling point at the altitude of the spring. The waters rise highly charged with hydrogen monosulphide and carbon dioxide, and contain in solution calcium, sodium and magnesium carbonates, sodium and potassium sulphates, and sodium chloride, the largest mineral constituent being sodium sulphate. Around the eastern edge of the water are a number of cavities which the Indians use as bathing houses. At the southern end is a vapor jet in a cavity, in which the natives extemporize a steam bath by means of a blanket. A series of careful observations in December gave a temperature ranging between 140° and 141° Fah. The outflow is through the honeycombed rock beneath the surface, the line of the flow being marked by openings, many of them emitting vapor. The beds of all outlets of the various springs and openings are coated with mineral matter, largely sulphur from decomposing hydrogen sulphide.

A cantonment for the protection of Southwestern Colorado has been established at the springs, and as an offset to certain claims to the land about the springs, the President reserved, in May, 1877, a square mile, including the springs, as a town site. At a grand council held by the Ute Commission with the Ute bands last fall, the Indians begged that the government should retain possession of the place, so that all persons, whether whites or Indians, might come there and be healed. Lieutenant McCauley expresses the belief that at no distant day these springs are destined to become a place of great resort, and to play no mean part in the sanitary economy of Colorado.

The Central Park Zoological Collection.

The annual report of the Director of the Central Park Menagerie gives the number of animals exhibited during the past year as 1,060, of which 417 were mammals, 616 birds, and 27 reptiles. The additions to the collection during the year were 486, of which 74 were presented, 129 deposited by exhibitors, 20 were born in the menagerie, and 12 (birds) were captured in the Park. The births were: 9 lions, 4 prairie wolves, 2 camels, 1 zebu, 1 fallow deer, 1 hog deer, 1 Mexican deer, with quite a number of white and black swans. Among the animals presented were a sun bear, Sumatra squirrels, and a doe and fawn from Memphis; the last having been sold for the benefit of the yellow fever sufferers and presented to the Park by their purchaser.

The autopsies of animals dying in the Park discovered that an African elephant succumbed to pulmonary congestion, a black bear to chronic peritonitis, a lioness to rupture of the bladder, and an Indian antelope to a distended paunch.

Among the specimens that have survived ten years or more in confinement are several Cape buffaloes, bisons, leopards, pumas, zebus, wapiti deer, and many other mammals and birds.

The animals belonging to the Park are estimated at a value of $12,027; those owned by exhibitors are worth some $51,680. As to the feeding of the collection, 46,713 pounds of meat, 16,356 pounds of bread, 2,197 pounds of fish, and 1,653 quarts of milk have been consumed by the carnivorous animals.

The Director of the Menagerie is Mr. William A. Conklin.

DEFEAT OF THE COCHRANE PATENTS.

In 1863, Mr. William F. Cochrane was granted a patent for a "new and useful method of bolting flour." The improvements claimed consisted in: 1. Bolting the meal over a series of reels, covered with cloth of increasing fineness, in combination with a blast, substantially in the manner described.

2. Running the offal through the entire series of reels, substantially in the manner described, for the purpose of making the flour bolt more freely.

3. Re-bolting the "white middlings" flour after regrinding and mixing them with offal, substantially as described.

4. Conducting the flour made upon each reel into a separate compartment, substantially in the manner described, for the purpose of making a variety of grades, or mixing them in any proportion desired, as set forth.

In the reissue of Mr. Cochrane's patent in 1874 it was described as "a new and useful improvement in the art of manufacturing flour," the inventor claiming:

"The herein before described process for manufacturing flour from the meal of ground wheat by first taking the pulverulent impurities, by subjection to the combined operations of screening and blowing, and afterwards re-grinding and re-bolting the purified middlings."

The assignees of the Cochrane patents promptly brought suit against millers making flour from purified middlings, the claims involved being finally brought to a decision in the United States Court in St Louis, March 17.

The decision by Judge Dillon read as follows: "The reissued patent is a process patent for an alleged new and useful improvement in the art of manufacturing flour. The claim therein, as construed by the complainant, is for the use of five consecutive steps performed in the act of manufacturing flour in a definite order, viz. 1. Grinding the wheat into meal. 2. Taking out the superfine flour. 3. Taking out the pulverulent impurities by the combined operation of screening and blowing, so as to purify the middlings, which are then (4) reground, and then (5) rebolted.

"The real value of the invention described, and claimed in the reissued patent, consists in the purification of the middlings by screening and blowing, thus freeing them from the pulverulent impurities, and thereby fitting them to be reground into flour of a superior quality. The mode described in the patent, and accompanying models and drawings for bolts acting upon the meal or 'chops,' as sieves or screens, assisted in their operation by blasts of air introduced within them. The claim of the complainant is that wheat is ground by the first operation of the stones into meal, so that superfine flour is by the next step of the process taken therefrom, any purification of the middlings in residual mass (of which the valuable constituent is the middlings) by the combined operation of screening and blowing, intermediately, for the purpose of grinding and rebolting, whether such purifying is within the flour reels, or upon vibratory screens outside of reels, is an infringement of the Cochrane patent.

"Flour made from purified middlings is now, and since the year 1871 or 1872 has been, well known throughout the country as 'new process flour.'

"In what consists the essential value of this 'new process?'

"The answer is purified middlings, that is, the making of a first grade of flour out of middlings, from which it had generally been considered by the millers of this country (although more intelligent or advanced ideas prevailed in France, and perhaps elsewhere in Europe) impossible to produce, or, at all events, impracticable, profitably, to produce flour of the first quality.

"A fundamental question in the clause, underlying all others, is: did Mr. Cochrane, in his original patent, granted January 6, 1863, contemplate or provide for the purification of middlings by the combined action of the screen or blast?

"If he did not, the re-issue, which must be for the same invention as the original patent, and which makes the basis of its claim such purification of the middlings, is void.

"In the light of arguments of great ability and thoroughness, extending over a period of fifteen days, and illustrated at every step by exhibits, diagrams, and models, the judges who sat at the hearing have deliberately considered the question above stated, and have reached a unanimous conclusion upon it.

"It becomes my duty to announce the judgment of the court. I shall content myself with stating it without displaying in detail the reasons or elaborating the grounds upon which it rests. The description of the invention in the original patent as a 'method of bolting flour,' the progressively finer meshes in the three bolting reels therein described; the absence of any returns, the statement therein that the agency of the blast is to assist the bolting; the cupola or dome on the model, provided with screens which could have no other effect than to arrest the impurities, or the most of them, and return them directly to the flour, the enforced circuit of air containing any impurities that might escape the screens in the cupola, and returning the air under the conditions specified, laden with such impurities, directly into the reels; the absence of any statement in the patent of a purpose to purify middlings; the absence of any claim for purifying middlings; the statement that air is used to aid bolting, the obvious consideration that if air was used to purify middlings it could not fail to have occurred to so ingenious a mind as Mr. Cochrane's that this could be most easily and most effectively applied, as it is now almost universally applied, outside of the reels, or bolts, and not within them; the failure to provide for blasts of air in the separator; the low grinding which his process evidently contemplated, as evidenced by the successively finer meshes; the fact now established that the manufacture of middlings flour is not practiced without more or less high grinding or higher grinding than was ordinarily used in this country.

"The aforegoing considerations in connection with the extrinsic testimony as to what was done under the patent, all concur to satisfy us that the idea of Mr. Cochrane was the use of the blast in the reels as an aid in the mere process of bolting with the view of obtaining an increased quantity of choice flour, and not for the production of purified middlings. The re-issued patent having been expanded to embrace a claim for purifying middlings, when no such process was described, suggested, or claimed in the original patent, it is void. If this conclusion is sound, it is not necessary to consider the questions of anticipation or infringement, upon some of which, if compelled to decide them, we might not agree. The result is that the bills must be dismissed, and decrees will be entered according." Treat and Nelson, JJ., concur.

Swift's Comet.

On the morning of June 20, at one o'clock, Mr. Swift, of Rochester, discovered a new comet in Constellation Perseus, right ascension 2 minutes 30 seconds, declination north 58°. It was quite bright, with a short tail, and was moving about one degree a day east of north. Observations made at the Sheffield Observatory, New Haven, from the 20th to the 23d, indicate that the motion of the comet is retrograde; also that it had passed its perihelion. It is consequently receding from the sun, though still approaching the earth.

The reporter, "W. B.," under date of June 23, says: As it is a faint object, and likely to increase but little in brightness, it is probable that it will not be visible after this week until the period of bright moonlight is passed. Unless observations enough are obtained this week to enable the preparation of a fair ephemeris, it will be difficult to find the comet when the heavens are again suitable for observation.

A rough orbit computed from the Sheffield observations gave the following places for Washington mean midnight:

	R. A. h. m. s.	N. D.
June 24·5	2 49 50	68° 21′
June 25·5	2 50 40	69° 51′
June 26·5	2 51 35	71° 33′
June 27·5	2 52 20	73° 30′

A later report by Mr. Swift (June 24) states that, contrary to his expectations, the comet, instead of growing fainter, was increasing in brightness. That morning a nucleus was observable for the first time, the comet resembling somewhat Brorsen's. The nucleus appeared to be double.

Will it Pay?

The Fall River spinners' strike began, as threatened, June 25.

By the action of about 800 men the industry of 15,000 operatives has been arrested. The strike will cost the mill hands about $100,000 a week in loss of wages.

The leaders in the strike are described as operatives recently from England, particularly from Blackburn and Preston. It is further affirmed that no person prominent in these difficulties was an inhabitant of Fall River in 1871. One man is particularly described. He is a weaver who can get no employment in any of the mills on account of his bad reputation for causing trouble. He makes a business of agitating. Yet it is stated of him that he keeps his own child working so many hours a day that he has been arrested for a violation of the statute in such cases. A few men of this sort have been allowed by their fellow operatives to stop their work and stop their wages. Will it pay?

A Thousand Dollar Wooden Railway.

We have heretofore described the 18 inch military railway used at Woolwich Arsenal, England; but the narrowest gauge and cheapest railway as yet brought out is that of D. B. James, Visalia, Cal. Two stout bars of wood, so laid as to leave a groove between them, form the track. On this track a wheel with a bulge in the middle of its periphery that fits the groove is used, the wheel having a broad flange at each side of the bulge. One of these wheels placed at each end of a plank forms the car. It is alleged that twelve miles an hour can be got out of a wooden railway of this construction; and that its carrying capacity is very great. The cost is estimated at one thousand dollars a mile.

The Eclipse in 1880.

It is reported that Mr. A. F. Goddard, of Sacramento, California, is planning an excursion party of fifty or more observers, to be stationed along the route of the total eclipse of the sun in California, next January. The grandest points of view will be selected; and it is anticipated that much pleasure as well as scientific profit will result from the expedition.

M. FERDINAND DE LESSEPS, in a lecture at Amiens, stated that the first sod of the Panama Canal would be turned on January 1, 1880, and that with 40,000 navvies, including some Chinese and 15,000 Brazilian negroes, the work would be completed in eight years.

RECENT AMERICAN PATENTS.

A variety of widely differing subjects are represented in the engraving on this page, showing the great diversity of American inventive genius.

Fig. 1 represents a novel machine intended for aerial navigation, invented by Mr. Henry Badgley, of Fairfax Court House, Va. The boat carries a motor, and has at opposite ends propeller wheels for moving it either backward or forward. A portion of the shaft is flexible, so that the rear propeller wheel may be turned in a horizontal plane for the purpose of steering. From the center of the boat a mast rises, carrying at its upper end a cylindrical balloon, which is well stayed and provided with a safety valve. A sleeve upon the mast supports a horizontal propeller wheel, which receives its motion from the motor. This wheel is intended, to supplement the balloon in raising the boat.

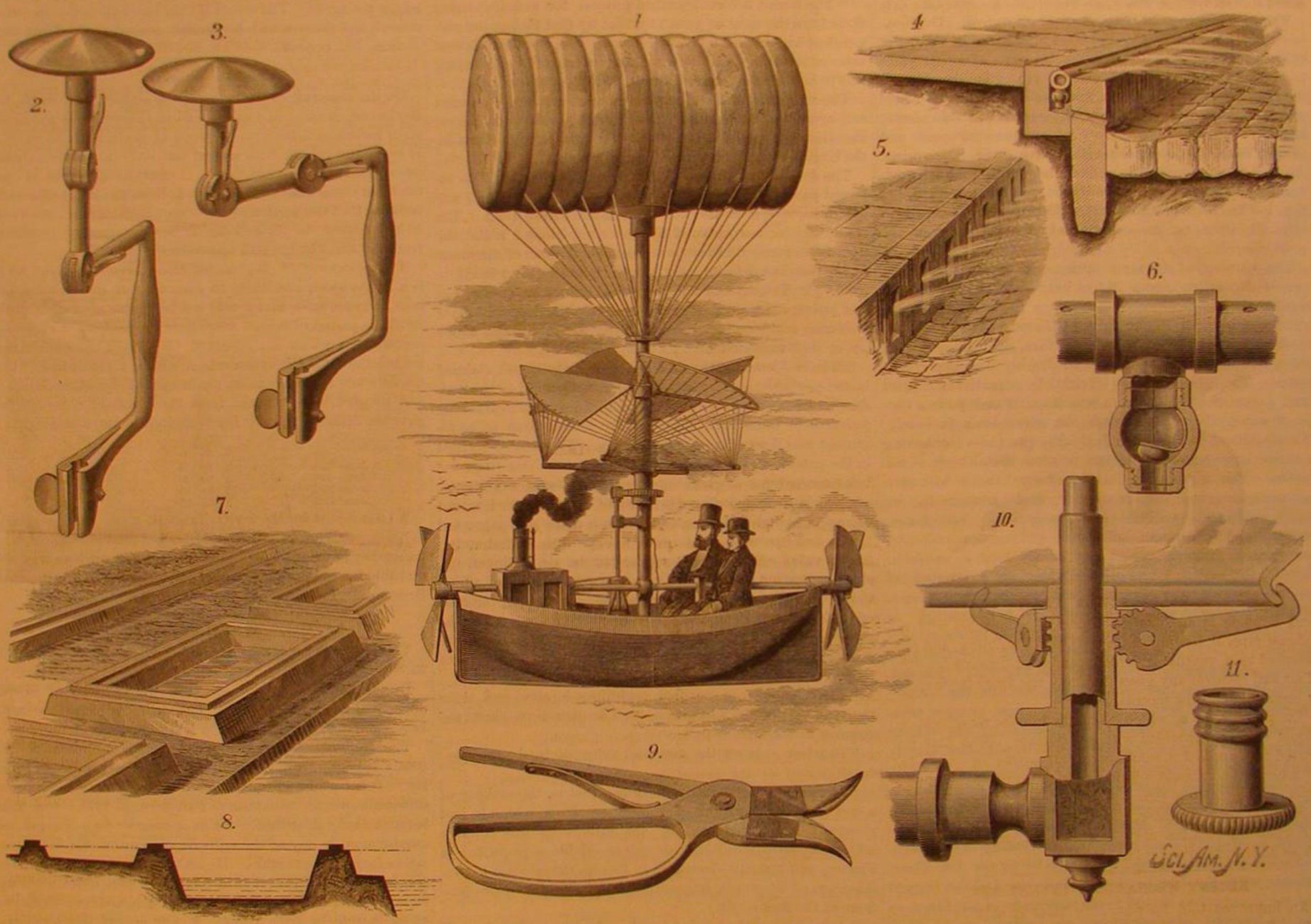
The bit stock, shown in Figs. 2 and 3, is the invention of Mr. Loyd C. De Bert, of San Francisco, Cal. The upper portion is jointed, so that the tool may be used either as an ordinary hand brace or as a crank brace.

Figs. 4, 5, and 6 represent a street sprinkling apparatus, patented by Mr. Dana Mansfield, of St. Louis, Mo. It consists of a water pipe fixed along the curbstone to sprinkle the street from jet holes in the pipe. Two arrangements of the apparatus are shown in Figs. 4 and 5, and in Fig. 6 is represented an automatic valve for permitting the escape of the water remaining in the pipes after the pressure is taken off.

Mr. Hugh O. Ames, of New Orleans, La., has patented an improved method of obtaining pure water from rivers. This invention, which is shown in Figs. 7 and 8, relates to the construction of reservoirs for filtering turbid water obtained from rivers, and it has been especially devised for obtaining water from the Mississippi, which at certain seasons of the year is so charged with alluvial matter as to be unfit for use until filtered. The reservoirs are located in the sedimentary accretions in the river bed, and are combined with levees or walls constructed of sedimentary material, which acts as filtering media as well as for excluding the turbid water from the reservoir when the river is at its highest stage or flood level.

Fig. 9 represents an improved tool for cutting and bending wire, recently patented by Mr. Charles W. Miller, of Sycamore, Ill. It is designed more particularly for cutting and withdrawing the binding wires of grain sheaves. The jaws are flared out to render it easy to grasp the wire, and they clamp the wire as soon as it is cut, so that it may be readily removed from the sheave.

Figs. 10 and 11 represent an ingenious holder for globes and shades of gas burners and other lights, recently patented by Mr. Joseph Breeden, of Birmingham, England. In this holder the arms or claws are made to expand and contract to suit different sized globes and shades, and to admit of readily attaching or detaching the globe or shade. The radial arms are pivoted to ears fixed around the central tube of the burner; and the arms work in vertical planes, so that by bringing them nearer to a vertical or horizontal position, their extremities will diverge more or less. Each arm has a toothed sector, and all of the arms are adjusted simultaneously by a tangent screw or worm gearing with the toothed sectors of all the arms. This worm, which is shown in detail in Fig. 11, rotates on the central tube of the burner, is confined between collars, and is provided with a milled flange, by which it is turned.



RECENTLY PATENTED NOVELTIES.

Exhibition of Sanitary Appliances.

In connection with the annual meeting of the British Medical Association to take place in the Queen's College, Cork, from the 5th to the 8th of August, there will be held an exhibition of sanitary and hygienic appliances.

An address on public health will be delivered by Dr. Andrew Fergus, President of the Faculty of Physicians and Surgeons, Glasgow; and the various meetings and discussions in this department, to which the public will be admitted, will be conducted as far as possible in connection with the sanitary exhibition.

The exhibition will be divided into the following departments: I. Drainage, sanitary appliances, and disposal of refuse. II. Water supply, filtration, and river purification. III. Food, clothing, and disinfection. IV. Sanitary building appliances, plans and models, ventilation, heating, lighting, and consumption of smoke. V. Disposal of the dead. VI. Sanitary literature.

The City of Cork Steam Packet Co., the Clyde Shipping Co., and the Messrs. MacIver, of the Cunard Line, have generously consented to convey exhibits free of freight to Cork by their respective steamships. Under powers conferred by the "Protections of Inventions Act, 1870," the Board of Trade will grant a certificate giving provisional protection to all unpatented inventions. All applications for space should be made before June 30.

A Swiss Exhibition.

Switzerland has appointed the year 1881 for an international exhibition of watches, jewelry, snuff boxes, and musical boxes—a display in which the ancient Republic may well call the rest of the world to see what she can do. This project adds another illustration to the recent tendency of international exhibitions, especially in smaller countries, to run to specialties. This will be the first exhibition of the sort in Switzerland.

Correspondence.

Petroleum in Steam Boilers.

To the Editor of the Scientific American:

Some ten months ago I noticed in your valuable paper an article wherein you strongly recommended the use of petroleum to preserve iron. At that time I had received a new boiler of 8 horse power nominal, which I use for grinding wheat and sawing. Fearful of the result which happened to a boiler I had just condemned after 18 months' use, I determined to give it a thorough trial with refined petroleum, the result of which is most satisfactory, as you will observe by the following:

The water I use is strongly impregnated with lime. Although very clear before used it soon becomes white and thick, and the boiler commences to prime or foam, causing me to run at a low pressure, and an almost constant use of olive oil, injected into the boiler through feed pump (a thing I was often cautioned against by an old English engineer of fifty years' experience), assuring me that oil had a bad effect in the steam chest. I knew of no other remedy, and continued to use it until, at the end of 18 months, my boiler was destroyed. The iron in the steam department had become like a sponge, and I put more than 30 holes through it with a pocket knife; but the boiler I now use I commenced by thoroughly wetting inside with petroleum before filling. I work on two weeks, blow off the water, scrub clean with brooms, throw in straw in firebox, and warm the boiler with slow fire, and when perfectly dry I again wet down thoroughly with refined petroleum, and up to writing not the least incrustation has formed on the boiler, and no priming or foaming is ever seen; and instead of having to spend two days every two weeks to go all through the boiler with chipping hammers (a thing detestable), twenty minutes only is required with a scrub broom. Fuel is saved, time is saved, and my boiler is preserved, and I feel under lasting obligations to you for the hint.

I use about half a gallon of petroleum at each wetting down, and for days I see the petroleum bobbing in the gauge glass and all going smoothly, and I am almost of the belief that petroleum will make a boiler do most anything but talk.

I notice in your April number that J. R. F. inquires if petroleum has ever been used in marine boilers as a preventative for priming. From the experience I have had with it there is nothing to be feared but good results.

JOHN COBB.

United States Vice-Consulate, Casablanca, Morocco, June 5, 1879.

A MAGNETIZED WATCH.

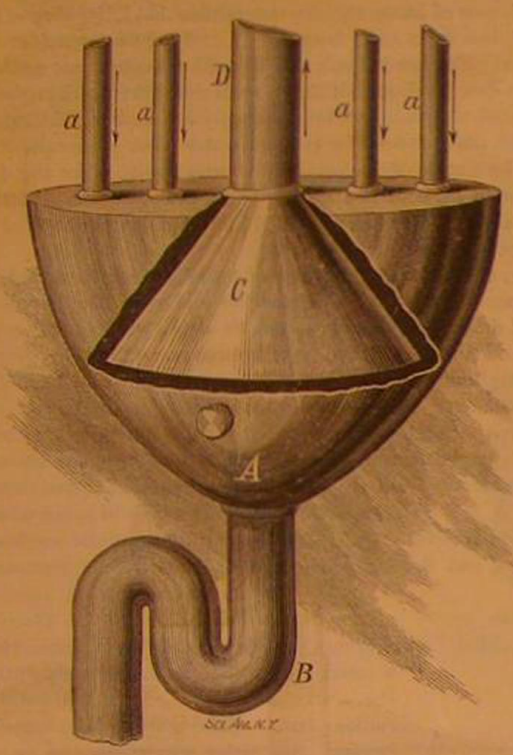
A lady in Madrid, Me., who carried a valuable gold watch, was in a house last summer when it was struck by lightning. The watch stopped at the time, and, although jewelers have repeatedly examined it and pronounced it perfect in every particular, it cannot be made to move. It is so magnetized that watchmakers say no part of it could ever be made to do duty if taken out and put into another set of works.—*Springfield (Mass.) Union.*

We venture to say that no watchmaker who reads the SCIENTIFIC AMERICAN would say that a magnetized watch cannot be perfectly restored. By the use of a magnet any watch that has been magnetized can be very easily demagnetized and the timepiece restored to its former usefulness. We will give an article on this subject before long from the pen of an esteemed correspondent, showing how to demagnetize a watch, with other interesting facts connected with the subject of demagnetization.

A NEW SEWER TRAP.

We give herewith an engraving of an improved sewer trap recently patented by Mr. Thomas J. Fales, of 118 Liberty street, New York. It consists of a sewage receptacle, A, connected with a goose neck water trap, B, and having a closed top into which the drain pipes, *a a a a*, are inserted.

Within the receptacle, A, and above the mouth of the



FALES' SEWER TRAP.

trap, B, there is an inverted funnel, C, connected with an exhaust pipe, D, leading to the roof of the building, and surmounted by a ventilator, which causes an upward draught of air and removes any gases that may rise from the trap, B, or accumulate in the receptacle.

The pipes, *a a a a*, which discharge into the receptacle, A, should each be provided with an S trap. With this improved trap applied it would seem impossible for gas to enter a house, and should a leakage occur in any of the smaller pipes, *a*, they may be removed or repaired without the escape of gas from the sewer pipe.

Further information may be obtained from the inventor, whose address is given above.

RECENT MECHANICAL INVENTIONS.

An improved tool for punching holes or slots in leather straps, for the insertion of the buckle tongue, has been patented by Mr. Bartless Bohonon, of West Farlee, Vt. It consists in a hand punch fitted with a revolving head that carries cutters of different sizes.

Mr. George O. V. Roedern, of Indianola, Texas, has patented an improved piano action, the principal working and supporting parts of which are made of sheet metal. Although its construction is quite simple it cannot be readily described without an engraving.

An improved device for stretching the toes of boots and shoes has been patented by Mr. William Nagle, of 229 Grand street, Brooklyn, E. D., N. Y. It is so contrived that it may be applied to various sizes of boots and shoes. It is quite simple, and is a desirable instrument for dealers in boots and shoes.

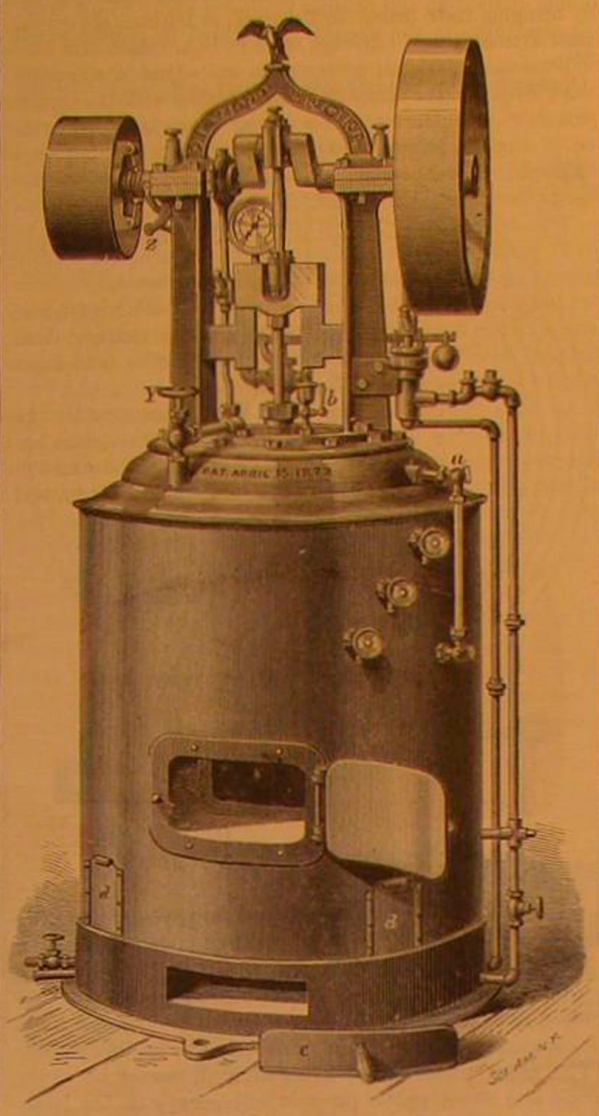
Mr. Rufus P. Bowdoin, of Brooklyn, N. Y., has patented an improved device for converting reciprocating into rotary motion. It is especially intended for use in connection with steam engines, and it consists in combining with a reciprocating slide a shaft fitted with diametrically opposite cranks, a pair of toggle joints, and links for connecting them with the cranks.

An improvement in doubling and winding machines has been patented by Mr. Thomas Unsworth, of Manchester, England. It consists in a novel combination of mechanical devices by which improved results are secured. The machine cannot be properly described without an engraving.

Mr. Joseph H. Townsend, of Brooklyn, N. Y., has patented an improved sheave for rolling doors in which a plate and a stop are combined with a case, roller, and eccentric pin.

A NEW PORTABLE ENGINE.

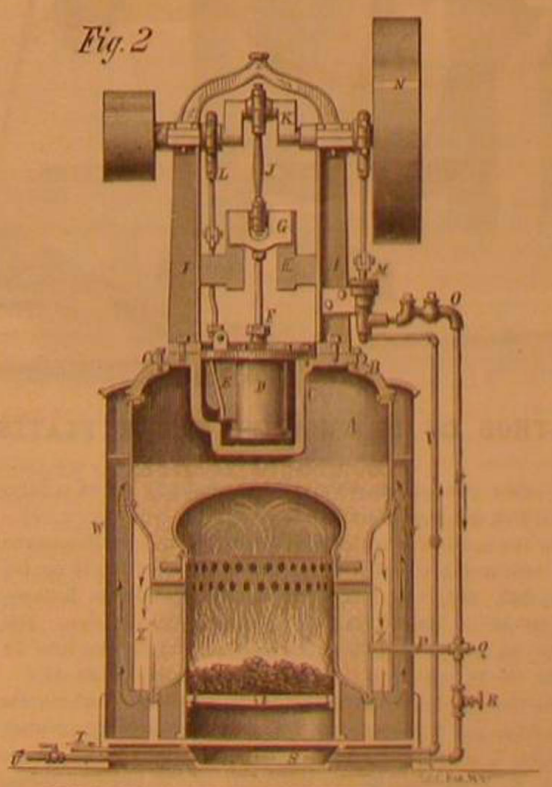
The accompanying engravings represent an improved portable self contained steam engine, called the "Diamond."



FALES' PORTABLE ENGINE.

It is intended for a great variety of uses where a light, safe, and economical power is required. Externally this engine appears like others in market, but there are points in its construction that seem quite novel. The cylinder, D, and its valve chest, E, are suspended in air chamber, C, which projects downward into the steam room of the boiler, A, and really forms a portion of the upper head of the boiler. All of the parts of the engine are separate from the boiler, and may be removed from it while steam is up if necessary. The cylinder, D, has its upper head extended, forming a flange for its support. The crank shaft, K, and the moving parts connected therewith, are supported by the standards, I, which, together with the guides, H, and the ring that sets upon the flange of the air chamber, C, form a single casting. It will be seen that this construction insures rigidity, and at the same time admits of getting at the various parts for adjustment or repair.

Fig. 2



VERTICAL SECTION OF ENGINE AND BOILER.

The boiler is contracted below the crown sheet and provided with a deflector, X, which carries the smoke issuing from the short horizontal flues downward to the base of the boiler, whence it passes upward to the smoke stack.

The fire is in direct contact with the water surface in the fire box, and all of the surfaces exposed to any considerable heat are entirely covered with water. Ample means are provided for cleaning the interior of the boiler, a point of great importance, especially in this class of engines.

The pump, M, draws water through the heater, S, which is placed directly under the grate, and the water pipes are connected with the boiler, so that the heater may be blown out and cleaned by water and steam from the boiler.

The manufacturers claim great advantages in the use of the hot air chamber in which the cylinder is placed. It is equivalent to a steam jacket, so far as its advantages are concerned, but it has not the disadvantages of always being moist and in a state of corrosion.

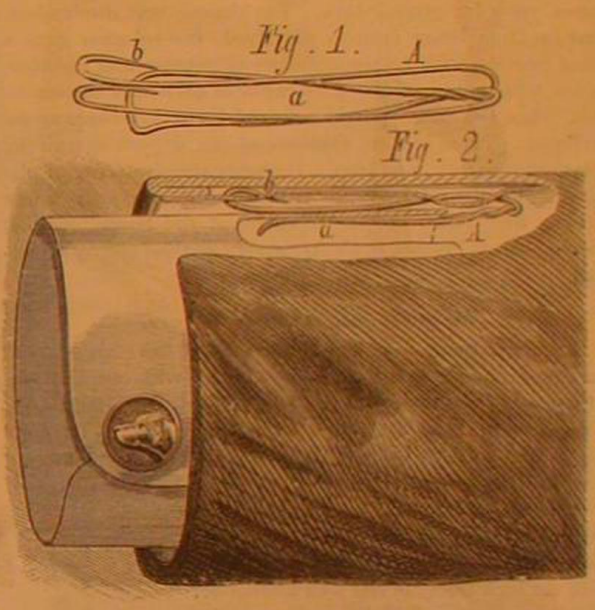
The governor attached to this engine is placed in the pulley and avoids the possible derangement of the governor valve by bending the stem, by drawing instead of pushing in the direction of the greatest strain.

The engine is provided with all of the usual appurtenances, such as the safety valve, gauge cocks, water gauge, steam gauge, etc., etc., and the manufacturers inform us that the workmanship and materials are first-class.

Further particulars may be obtained from Mr. Thomas J. Fales, general agent, 118 Liberty street, New York, P. O. box 3971.

NEW CUFF HOLDER.

The annexed engraving represents a simple and convenient device for attaching cuffs to the sleeves of garments, recently patented by Mr. Charles F. Doring, of Troy, N. Y. It consists of a piece of spring wire bent into a loop, *a*, twisted together and returned upon itself, and having hooks, *b*, formed



DORING'S CUFF HOLDER.

on the ends, as shown in Fig. 1. The holder is shown in position on a sleeve in Fig. 2. The loop, *a*, springs down upon the back of the hooks, *b*, forming a spring clamp that is capable of retaining the cuff securely in place, dispensing with buttons, and affording a ready means of adjusting the cuff. After the holder is once placed in the sleeve it may remain until the garment is worn out.

Further information may be obtained by addressing the inventor at No. 12 Harrison Place, Troy, N. Y.

The Convention of Civil Engineers.

The eleventh annual convention of the American Society of Civil Engineers was held in Cleveland, Ohio, June 17 to 21. The meeting was regarded as one of the most largely attended, enjoyable, and profitable ever held by the society. The officers were: Mr. Charles Paine, General Superintendent of the Lake Shore and Michigan Southern Railway, President; Mr. John Bogart, of New York, Secretary; and Major Geo. W. Dresser, editor of the *American Gaslight Journal*, Assistant Secretary. The Committee on Papers were: Mr. Octave Chanute, Chief Engineer of Erie Railway, New York; Col. W. E. Merrill, U. S. Engineer Corps, Cincinnati, Ohio; and Mr. John Kenedy, Chief Engineer of the Montreal Harbor Commission.

A large number of important papers were read and discussed, and a great deal of professional sight-seeing and practical study was undertaken. The daily programmes included visits to the Cleveland Viaduct, the reservoir and pumping works of the Cleveland water works, the Telegraph Supply Company's works, and many other important engineering and industrial establishments in and about Cleveland, besides more extended excursions to the Mahoning Valley coal fields and the Bradford oil district.

Among the resolutions adopted by the society was one in favor of holding, in addition to the annual convention, a number of general meetings in various cities in each year for professional intercourse.

The Quickest Atlantic Passage.

The new steamer Arizona, which passed Sandy Hook at half past five, June 17, arrived at Queenstown at twenty minutes past seven the morning of June 25. The actual running time was 7 days 9 hours and 23 minutes, the fastest transatlantic trip on record. This is 1½ hour less than the time of the Britannic, in August, 1877.

The Smoke of an Electric Lamp.

At our meeting in December, 1878, Mr. J. W. Swan exhibited an electric lamp, on the incandescence principle, which had broken down in consequence of the electric force being too great for the cylinder of carbon through which it had to pass. One of the points of interest noted was the appearance of a sooty deposit on the inside of the glass. The flask which contained the carbon pencil and its platinum conductors, having been filled with nitrogen and exhausted with a Sprengel pump, was supposed to contain nothing which could act as a carrier to convey by chemical means any carbon from the incandescent pencil to the cooler surfaces in its neighborhood. The phenomenon appeared to be such as has been spoken of under the term "volatilization of carbon." Mr. Swan having placed the lamp at my disposal for examination, I have now the pleasure of bringing under your notice the results. Under the microscope the smoky deposit on the glass showed numerous bright globules, no doubt platinum, and more minute particles of dark matter nebulous under a quarter inch objective. A fragment of the glass being exposed to an oxidizing heat, the deposit partially disappeared, still leaving the glass slightly darkened.

The platinum support—which had also a coating of dark sublimate at a little distance above and below the carbon pencil, but not in immediate juxtaposition with it—was next examined by exposing to the blowpipe flame the unsmoked portion, so that the conducted heat might act upon the deposit without the fear of the blast carrying away the matter, which was very loosely attached. In this way the deposit was burnt off without the mechanical action of the blast, the heat to which it had been subjected being that of dull redness. A piece of the glass was then treated with *aqua regia* for several days. The deposit was diminished, but far from being entirely dissolved; the solution gave a blue reaction with yellow prussiate of potassa, and no coloration with tannin till aided by vapor of carbonate of ammonia, when the usual purple color of ferric tannate was developed. There is thus evidence of the deposit containing platinum, carbon, and iron. Probably the scattering of platinum globules might result from the disruptive discharge which took place at the moment of the lamp breaking down.—*B. S. Proctor, in the Newcastle Chemical Society's Journal.*

Asphalt and Timber Floors.

A curious method of laying down floors has been adopted in France, and is said to have obtained a wide application. It consists in putting down flooring, not, as hitherto, on joists, but in embedding the boarding in asphalt. The new floors are used mostly for ground stories of barracks and hospitals, as well as churches and courts of law. Pieces of oak, usually 2½ to 4 inches broad, 12 to 30 inches long, and 1 inch thick, are pressed down into a layer of hot asphalt, not quite half an inch thick, in the well known herring bone pattern. To insure a complete adhesion of the wood to the asphalt and obtain the smallest possible joints, the edges of the pieces of wood are planed down, beveling towards the bottom, so that their cross section becomes wedge like. Nails, of course, are not necessary, and a perfect level surface may be given to the flooring by planing after the laying down. The advantages of this flooring, which only requires an even bed on which to rest, are said to be the following:

1. Damp from below and its consequences, rot, are prevented.
2. Floors may be cleaned quickly and with the least amount of water, insuring rapid drying.
3. Vermin cannot accumulate in the joints.
4. Unhealthy exhalations from the soil cannot penetrate into living rooms. Asphalt being impermeable to damp, rooms become perfectly healthy even if they are not vaulted underneath. In buildings with several stories, as in hospitals, the vitiated air of the lower rooms cannot ascend, an object which it has hitherto not been possible to attain by any other means.
5. The layer of asphalt will also prevent the spreading of fire from one floor to another in case of conflagration. The flooring here described has been laid in the numerous casements of the newly constructed forts round Metz, to the satisfaction of the authorities. The cost is about a shilling per square foot. This estimate, somewhat high, would be much lower in districts where oak and labor are cheaper, and the distance from the places of construction less, and especially where there is more competition among contractors than at Metz; and the cost for larger undertakings may be reduced to eight shillings per square meter.

A CURIOUS ancient Mexican library has been found in the ruins of a vast palace at Xayi, near Chiapas, in southern Mexico. The writings are inscribed on terra-cotta tablets, half an inch thick, and are supposed to be sacred records, but the language in which they are written is not accurately known.—*L. A. Commercial.*

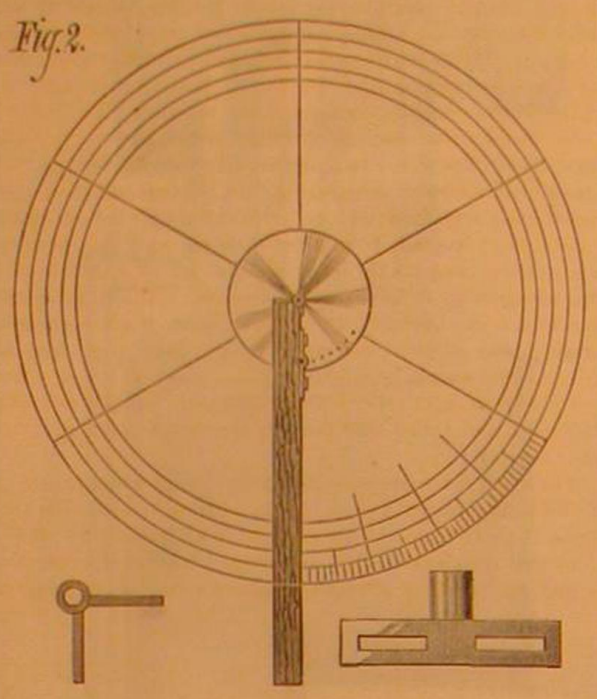
AMATEUR MECHANICS.

INDEX PLATES FOR GEAR CUTTING.

There are many amateurs who would make their own gear wheels were it not for the expense of purchasing or the trouble of dividing and drilling the index plate, which is the principal item in the apparatus required in cutting small gears.

Of course an index plate may be purchased, but the money thus laid out would go a long way toward paying for cutting all the gears that would ever be required by most amateurs.

Fig. 2.



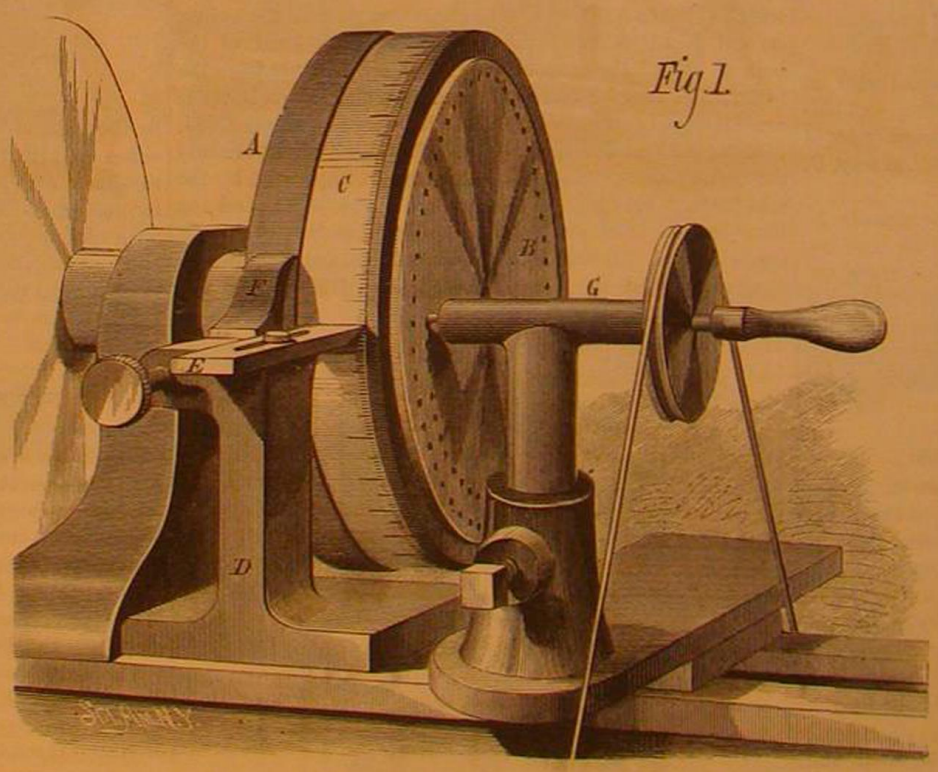
INDEX PLATES FOR GEAR CUTTING.

It is admitted that it is difficult to obtain absolute accuracy by ordinary methods, but the plans here suggested will probably give as nearly perfect results as can be obtained without copying another index plate or using a dividing engine.

The index plate, before being divided, should be nicely turned and fitted to the place it will occupy on the lathe. This will generally be on the larger side of the cone pulley.

Two methods of graduating an index plate are illustrated by the accompanying engravings. One consists in locating the holes by using paper scales which are printed from engine divided plates, and are therefore very nearly accurate.

Fig. 1.



METHOD OF GRADUATING INDEX PLATES.

The other consists in dividing the plate by aid of a large paper disk graduated by hand.

For the most of purposes four rows of holes will answer. The best number of holes for the different rows is as follows: 240, 200, 144, 132. 240 can be divided as follows: 120, 60, 48, 40, 30, 20, 15, 12, 6. With 200 divisions: 100, 50, 40, 25, 20, 10, and 5 may be made. 144 divides into 72, 48, 36, 24, 18, 16, 12, 9, 8, 6. 132 into 66, 44, 33, 22, 11.

The best method of dividing an index plate of which the writer has any knowledge, aside from duplicating another, or using a dividing engine, is shown in Fig. 1. A wooden block, A, is attached to the face plate of the lathe by means of screws and turned down truly on the face and upon the edge. A portion of the edge is turned to a suitable diameter for receiving a certain length of paper scale, C. The other portion of the edge is pressed by a brake shoe, F, which is kept up by a screw in the standard, D. An index, E, is slotted and secured to the top of the standard, D, by a screw. To the face of the block, A, is secured the index plate, B, and in front of the plate there is a drill support which takes the place of the ordinary tool rest. The drill is capable of longitudinal as well as rotary motion in its support; it is driven by a belt from the drive wheel of the lathe, and is pushed forward a limited distance by the handle swiveled to the end of the drill spindle. The size of the drill will be governed altogether by the size of the plate; but in any case it should be as large as possible, always bearing in mind that the space between the holes should be of sufficient width to insure the required strength.

That portion of the wooden block, A, which receives the paper scale, C, is carefully turned so as to permit the ends of the scale to abut; the scale being very carefully cut so that its ends will join accurately and render the graduations of the scale uniform throughout. The scale is best attached to the block by means of paper tacks or small screws. For the greatest number of graduations given above, a two foot paper scale, or two pieces of shorter scales, will be required. The inches should be divided into tenths. The block should be 7·64 inches in diameter where it is surrounded by the scale. The diameter of that part engaged by the brake shoe is not limited to any particular size.

It is obvious that for drilling 240 holes every mark on the scale must be brought opposite the index, E, and stopped by means of the brake, F, while a hole is drilled. After drilling this row of holes, the row containing 144 holes should be drilled, leaving a space between it and the 240 row for the 200 row. For the 144 row the operation is the same as that already described, except that a scale divided into twelfths is used, and alternate graduations only are noticed, the intermediate ones should be crossed out so that the scale will really be a scale of inches divided into sixths. For the 132 row the block is turned down to 7 inches diameter, and the scale last used is shortened to 22 inches and again applied to the block and used as before.

After completing these rows of holes the drill is moved to the space between the first and second rows, the block is turned down to 6·36 inches, and 20 inches of the paper scale first used (inches divided into tenths) is employed. Every graduation on the paper scale is used in this case as in the first instance. This gives 200 divisions.

The paper scales recommended for this purpose are those used by engineers and draughtsmen. They may be obtained for a few cents from any dealer in mathematical instruments.

In Fig. 2, the larger circle represents a disk of paper which is carefully divided into large spaces by means of ordinary dividers, and the large spaces are subdivided in the same way.

In the center of the paper disk is placed the plate to be divided, and from the center of the plate rises a stud, to which is accurately fitted the sleeve attached to the end of the radius bar. The radius bar extends beyond the outer circle on the paper disk, and carries an adjustable sleeve, to which is accurately fitted a drill which may be rotated by means of a small drill stock. The sleeve that forms the bearing of the radius bar is shown in detail in the lower left hand corner of the engraving, and the sleeve that receives the drill is shown in the opposite corner.

While drilling, the radius bar is held in place by a weight or by means of a clamp. After drilling each hole, the bar is moved forward one space and secured by the weight or clamp. When one row of holes is completed, the sleeve which guides the drill is moved toward the center of the disk, and the operation of drilling is carried on as before. By this method whatever errors may exist in the graduations on the paper disk are greatly reduced in the index plate, and the plate produced will be accurate enough for most purposes if the work on the paper disk has been carefully done. The smallest plate should be at least three sixteenths of an inch thick, and the holes should not be drilled quite through. Either iron or brass may be used for the disk. The latter works the easiest and will answer every purpose.

In a subsequent article a simple gear cutter will be described which may be readily applied to any foot lathe. M.

Instrument of Resuscitation.

A Frenchman has the credit of inventing an apparatus for aiding in the resuscitation of persons apparently drowned, or who from any other cause have been temporarily deprived of animation. It consists of a cylinder of sheet iron large enough to contain the body of an adult person. It is closed at one end, and the inanimate individual is inserted, feet foremost, in the receptacle as far as the neck, round which there is placed a padded diaphragm, fastened to the cylinder so as to be airtight. An air pump, attached to an opening in the tube, creates a partial vacuum, and then the outer atmosphere, by its own pressure, forces its way into the lungs by the mouth and nostrils, which are left exposed. By a reversed action of the pump the air is allowed to re-enter the

cylinder, and respiration is thereby re-established. A glass plate inserted in the iron casing enables the operator to watch the movements of the chest, which rises and falls as in life with the working of the pump. The action may be repeated, it is stated, eighteen times in a minute, an exact imitation of natural breathing being thus produced.

NEW DRAG SAWING MACHINE.

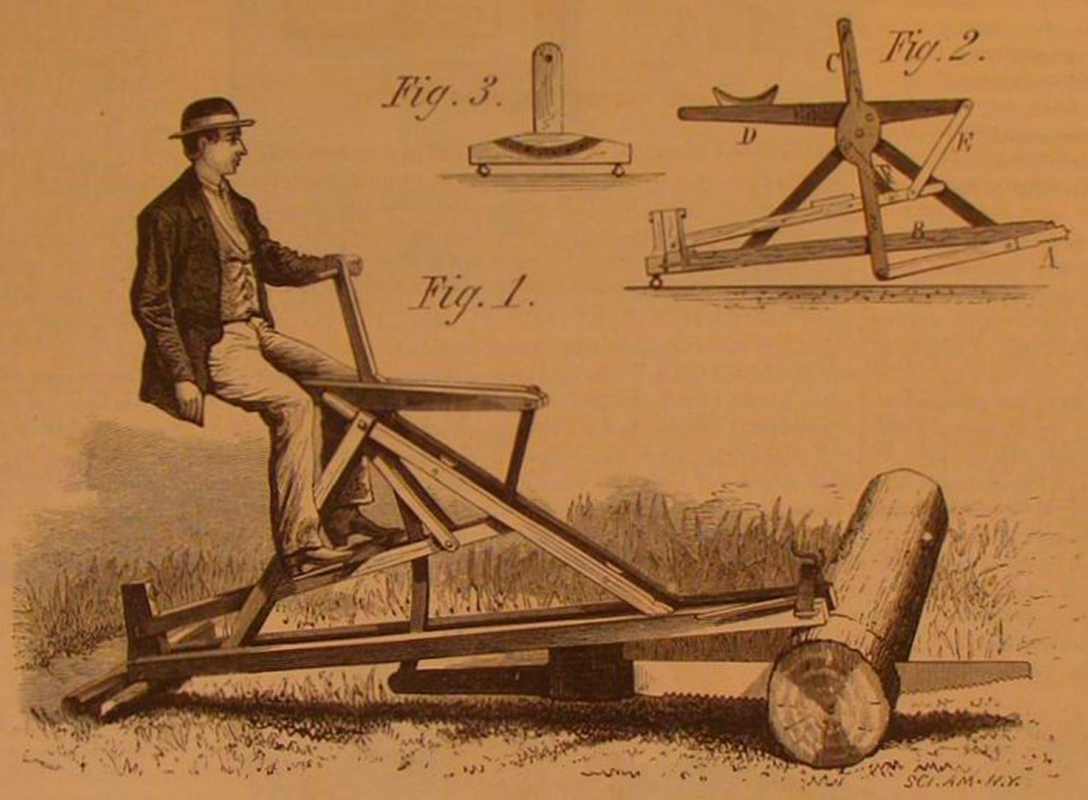
The engraving on this page represents, in Fig 1, Messrs. Alters & Brasington's improved drag saw in actual operation, and in Figs. 2 and 3 the details of its construction are shown. The saw is capable of being easily operated by one man, as the weight of the operator, the pressure of his feet, and the power exerted by the hands are all utilized in giving a reciprocating motion to the saw.

The saw, A, runs between two parallel bars, B, which are connected with an upright pivoted to the standard, shown in detail in Fig. 3. This standard rises from a cross-piece which gives a broad base to the machine, and in which is set a perforated curved plate for receiving the latch or detent carried by the pivoted saw guide. By means of this device the saw may be adapted to inclined or uneven surfaces, as the saw frame may always be adjusted to a vertical position and secured by the detent or latch.

The saw head is pivoted at its rear end to the lower end of the lever, C, which reaches upward and is fulcrumed in the timbers rising from the bars, B, and is provided above the fulcrum with a T handle. In the lever, E, forward of its fulcrum, a rock lever, D, is pivoted. This lever is composed of two parallel bars united at the ends, and supports a saddle for the operator at one end, while the other end is connected by a link, E, with the treadle lever, which is fulcrumed at the rear of the machine just above the bars, B. The treadle lever is connected by a link, F, with the lever, C, at a point just back of its fulcrum. At the forward ends of the bars, B, there are a guide for starting the saw, and two spurs which enter the log and hold the machine in place.

The method of operating the machine will be clearly understood from Fig. 1. The operator sits upon the saddle, as indicated, and his weight being disposed forward of the fulcrum of the lever C, tends to throw the lever back, as does also the power exerted by the hands pushing forward on the handle, while the pressure of the feet of the operator on the treadle lever being expended on the lever, C, through the connecting bar back of the fulcrum, and the power exerted in drawing the lever back by the hands, throw the saw forward. Thus, by the weight of the operator, the pressure of the feet on the treadle lever, and the power exerted through the handle of lever, C, a reciprocating motion is communicated to the saw, by which it is rapidly and easily operated.

Further information may be obtained by addressing Messrs. Alters & Brasington, Maiden Rock, Wis.



ALTERS & BRASINGTON'S DRAG SAW.

Manganese Bronze.

This metal, of which further accounts will be found in back numbers of the SCIENTIFIC AMERICAN, also in our SUPPLEMENT, No. 51, is made by adding from one to two per cent of manganese to the proper proportions of copper and zinc as used in making brass or bronze.

In order to illustrate the progress made by this invention, Mr. P. M. Parsons lately sent to the South Kensington Museum a large collection of specimens for exhibition at the conversazione of the Institution of Civil Engineers. There was, says the *Mining Journal*, first, a splendid rolled plate, 9 feet long by 3 feet wide, No. 11 wire gauge, of beautiful color and perfect in texture and surface, together with angle bars and rivets of the same quality of metal rolled hot; also a smaller piece of two plates and an angle bar riveted together cold to illustrate the application of the manganese bronze to the building of torpedo boats, steam launches, yachts, etc., these plates, etc., being a part of some supplied to the Thames Ironworks Company for a torpedo boat built by them to the order of Messrs. Maudslay Sons & Field for the Admiralty. The manganese bronze was proposed by Messrs. Maudslay with a view to obviate the defect steel is liable to of rapidly oxidizing, and the contract for the bronze plates was taken under a stipulation that they should sustain the Admiralty test for steel plates, which they did perfectly, giving a tensile strength of over 29 tons per square inch and an elongation of 25 to 35 per cent, and bending without cracking to a much closer radius than stipulated by the Admiralty. Besides these specimens in rolled and forged metal there were a number of rolled rods of various sizes used for pump rods, and for making into bolts, etc.; several forged bolts and nuts, one of large size for holding on the blades of propellers; and, lastly, coils of wire, of various gauges from that used for making rivets down to the smallest size. In the way of castings there were a pair of connecting rod brasses belonging to the engines of one of a pair of vessels Messrs. R. Napier & Son, of Glasgow, are building for the Pacific Steam Navigation Company, in which engines nearly all the parts usually of gun metal are of manganese bronze, including the main bearings, crank pin, brasses, piston rings, etc. Besides this company, a large number of the principal steam navigation companies and engineers are using the manganese bronze for these purposes, it having been proved by careful experiments that it is at least 60 per cent stronger than gun metal, and wears three or four times as long. The next article is a casting of a cylinder and frame of a rockboring machine, shown to illustrate the applicability of the metal to make intricate castings; then, of the same metal, some castings for stop cocks, and a cycloidal propeller. The metal from which all these articles are cast has peculiarly valuable qualities. In the first place, in casting it runs very fluid, and the thinnest and most intricate castings can be made from it perfectly sound. It is wonderfully strong and tough when simply cast—a 1 inch square bar on supports 12 inches apart, required 4,256 lb. to break it, which is considerably above the strength of good wrought iron; a piece of plate not more than $\frac{1}{8}$ inch thick, cast in green sand, with a beautiful surface, was shown doubled up nearly flat without cracking; this same quality can also be forged and rolled, and then its strength is quite equal to that of steel.

The average tensile strength of the metal when forged or rolled is 30 tons per square inch, with an elastic limit of from 11 to 18 tons, and an elongation of from 20 to 45 per cent, this is in its annealed state; when it is cold worked or rolled, the breaking strength in bars or rods rises to about 40 tons per square inch, with an elastic limit of over 30 tons, and an elongation of about 12 per cent. When drawn into wire the strength goes up still higher, the highest yet obtained being about 70 tons per square inch; but further experiments are still being conducted, with a view to get a yet higher result, as it is believed from the peculiar musical tone the metal emits that it will be admirably adapted for the wires of musical instruments, as it will have the additional advantage of not rusting.

It will also be applicable to a variety of other purposes, for which ordinary brass is now used, such, for instance, as wood screws, hinges, the plates and other parts of locks, and brass fittings generally, for all these purposes a quality can be supplied at least twice as strong as ordinary brass, and not more costly. In order to test the strength of the metal for wood screws some were simply cast in sand of the manganese bronze, using an ordinary iron screw as the pattern, and these cast screws were tested against the iron screws they were made from by screwing each into solid blocks of wood up to the head without first boring any hole in the wood except for $\frac{1}{4}$ inch to enter the point of the screw; the result was both the iron and the bronze screw went into a piece of deal up to the head; they then did the same into a piece of hard Spanish mahogany; and, lastly, they were tried in solid boxwood; they both entered into this about $\frac{1}{4}$ inch beyond the screwed part, and then twisted off.

This test, therefore, showed that manganese bronze screws simply cast were about as strong as wrought iron, and when they come to be made of drawn wire, they will fully equal steel, and this superior strength will, no doubt, be of equal advantage for all the articles above enumerated.

CARBONIC ACID IN THE ATMOSPHERE.—The air contains in 10,000 parts 2·942 parts of carbonic acid by volume. The most extreme variations have not exceeded 3 parts in 10,000. —*J. Reiset in Comptes Rendus.*

Improved Process for the Manufacture of Gypsum Casts.

BY DR. VON DECHEUDEN, BONN.

The improvement consists in hardening the surface of the cast by means of some insoluble precipitates, which fill the pores, prevent dust from entering, and are not affected by water.

A few coats of a hot and saturated solution of borax, alum, or similar substances are applied with a brush until the surface has the desired hardness. Two coats will generally answer, but occasionally as many as five or six may be necessary.

A few (generally two) coats of a hot saturated solution of chloride of barium and a few coats of soap water are then applied with a brush, and the surplus soap is washed off until the clear water forms beads on the surface of the cast.

These operations can be performed in a few hours and produce a hard surface consisting of substances insoluble in water and which will prevent the appearance of yellow spots, for the neutral salts that have been employed will prevent any action of the gypsum on the iron contained in the same. Different neutral salts may be used, and the operations may be performed in the reverse order. Instead of chloride of barium, other barium, strontium, or calcium salts, that will produce an insoluble precipitate and will not produce oxide of iron, may be used.

Employment.

The following just sentiment was uttered by Daniel Webster, in a speech in the Senate of the United States. It should be had in everlasting remembrance:

"Sir, I say it is employment that makes the people happy. Sir, this great truth ought never to be forgotten; it ought to be placed upon the title page of every book on political economy intended for America, and such countries as America. It ought to be placed in every farmer's magazine and mechanic's magazine. It should be proclaimed everywhere, notwithstanding what we hear of the usefulness—and I admit the high usefulness of cheap food—notwithstanding that the great truth should be proclaimed everywhere, should be made into a proverb, if it could—that where there is work for the hands and the men, there will be work for their teeth. Where there is employment there will be bread. And in a country like our own, above all others, will this truth hold good—a country like ours, where, with a great deal of spirit and activity among the masses, if they can find employment, there is always great willingness for labor. If they can obtain fair compensation for their labor, they will have good houses—good clothing—good food, and the means of educating their families; and if they have good houses, and good clothing, and good food, and means of educating their children from their labor, that labor will be cheerful, and they will be a contented and happy people."

Tide Water Pipe Company (Limited) Opened.

At four o'clock in the afternoon of May 28, the monster pump of the Tide Water Pipe Company (Limited) was set in motion at Corryville, and the first oil entered the pipe and started toward Williamsport, reaching the latter place about 7:10 P.M. on June 4, one hundred and forty-seven hours and ten minutes after leaving Corryville.

The quantity required to fill the pipe was 20,000 barrels. This is the first 6 inch pipe line of any considerable length ever constructed. The line is 100 miles long. There are but two pumping stations, one at Corryville, and the other 22½ miles from this place. The highest elevation, 1,200 feet is reached about 31 miles east of Corryville, and from this point the oil reaches Williamsport by gravity.

The estimated cost of the line is between $700,000 and $800,000. The weight of pipe used is 5,000 tons. The minimum capacity of the line is 6,000 barrels daily, which can be increased under pressure to 10,000 barrels.—*Stowell's Reporter.*

New Alloy.

M. Phillips has made some experiments for the determination of the coefficient of elasticity and of the limit of elasticity of different bodies. He refers especially to a new alloy which was melted and cast by Matthey, of London. Its density at the freezing point is 21·6139. Its composition is: Platinum, 80·660; iridium, 19·079; rhodium, ·122; iron, ·098; ruthenium, ·046. This alloy is so malleable and ductile that M. Sainte-Claire Deville possesses a thread of it, which is only a few hundredths of a millimeter in diameter, and is scarcely visible. A hundredth of a millimeter is only $\frac{1}{2533}$ inch.

MISCELLANEOUS INVENTIONS.

Mr. George W. Da Cunha, of 207 West 38th St., New York city, has devised a new form of drawing board, in which the frame is kept squarely in contact with the board. The shrinkage of the board is compensated for and an adjustable squaring edge is provided. The devicealso prevents the paper from wrinkling.

Messrs. Geo. A. Welden and Wm. K. Royce, of Austin, Mo., have invented an improved buckle for connecting harness traces with the shoulder straps. It is provided with a peculiar latching device, which renders it secure.

An improved attachment for hats, which holds them securely upon the head, and provides an air space on all sides, has been patented by Messrs. V. B. Waddell and James F. Sample, of Austin, Miss. It consists in a circular frame having angular adjustable rests attached to the hat.

A compound for incense coal has been patented by Mr. E. W. J. Lindesmith, of Leetonia, O. It consists of charcoal, an adhesive material, saltpeter, and a suitable perfume, mixed together with water, and dried.

Mr. Richard T. Ogden, of Philadelphia, Pa., has patented an improved coasting sled, adapted to carry a number of persons, and provided with several foot rests at each side. The forward runners are swiveled, and the seat board is provided with a fender and guide rolls.

Mr. Pierre Auguste De La Nux, of Honolulu, Sandwich Islands, has patented an improved saddle stirrup. The improvement consists in an elastic foot holder formed of vulcanized rubber, having a spiral spring core, and in the novel arrangement of an arbor and spur wheel.

Mr. Samuel P. Halleck, of Oriskany, N. Y., has patented an improved device for teaching arithmetic. It is adapted for use in schools and families, and is designed for teaching addition, subtraction, multiplication, and division. It consists in combining with rollers a notated rolling curtain, a curtain for cutting off a portion of the figures on the notated curtain, and weighted tapes for adjusting the curtains.

An improvement in washboards, consisting in pivoting between the rails, rolls, or bars, which may be locked so as to prevent them from turning, or may have pressure applied to them, so that they will add to the resistance in rubbing the clothes, has been patented by Mr. Ferris Freligh, of Rodney, Miss.

Mr. George W. Dean, of New York city, has patented an improved wash basin, provided with a novel valve, which permits the water to escape, but prevents the entrance of sewer gas. It consists of a tube placed in the overflow, and provided with a hinged valve seated upon the oblique end of the tube.

An improved thill coupling, patented by Mr. Richard W. Hawes, of Hohokus, N. J., consists in a cross pin provided with an annular groove near each end, and two elastic washers adapted to the grooves, which are sprung into the grooves after the pin is in place.

Mr. Carl J. Kramer, of Shiloh, La., has patented an improved combined sad iron and fluting roller. The sad iron is made hollow, open at the top and rear, and provided with a door at the rear, and arranged to receive the fluting rollers, which are heated by the iron block or coals that heat the sad iron.

An improvement in attaching electrical switch wires to binding posts, patented by Mr. James E. Hamilton, of New York city, consists of a screw plug, which enters the coil of the wire and makes a metallic connection, and at the same time connects the wire and its fibrous covering with the plug, which is adapted to the ordinary binding posts.

An improved fence post, having twisted wires held to the middle thereof by nails, and extended beyond each side of post in the form of bows to receive the boards which form the fence panels, has been patented by Mr. Jacob Frazer, of Centralia, Ill.

Mr. G. H. Weed, of South Norwalk, Conn., has patented an improved thill coupling, the novel features of which consist in an eccentric pawl pivoted between arms projecting from the clip attached to the axle, and in a yoke extending over the arms for confining the end of the thill iron provided with a lug, which is engaged by the eccentric pawl.

An improved corset, patented by Mr. George H. Clarke, Portland, Oregon, is designed especially for women nursing children, and is constructed with special reference to this particular use.

An improved packing box for eggs has been patented by Mr. Ignatz Karel, of Blue Earth City, Minn. It consists of a box packed with alternate plates and cylinders of pasteboard or sheet metal, and having on the cover and bottom corrugated springs, forming a yielding support for the contents of the box.

A butter and egg package, consisting of an air-tight and waterproof box, with drawers and intervailed strips, having longitudinal recesses in the edge, has been patented by Mr. Samuel McHenry, of Sparta, Ill.

An improved neck yoke coupling for vehicles has been patented by Mr. Samuel Brown, of Burnip's Corners, Mich. It is designed to prevent the tongue from dropping should a lug or the whiffletree become loose. It consists of two springs of peculiar form attached to the end of the tongue.

MACHINERY FOR MAKING SHINGLES.

To meet the popular demand for a very low priced, yet efficient machine for sawing shingles, short heading, pail bottoms, box boards, and other thin stuff, Messrs. Trevor & Co., of Lockport, N. Y., have designed the machine of the horizontal class shown in Fig. 1. It has a well designed iron frame, and will take a saw up to 38 inches in diameter. It is said to be fitted up in every respect equal to larger machines.

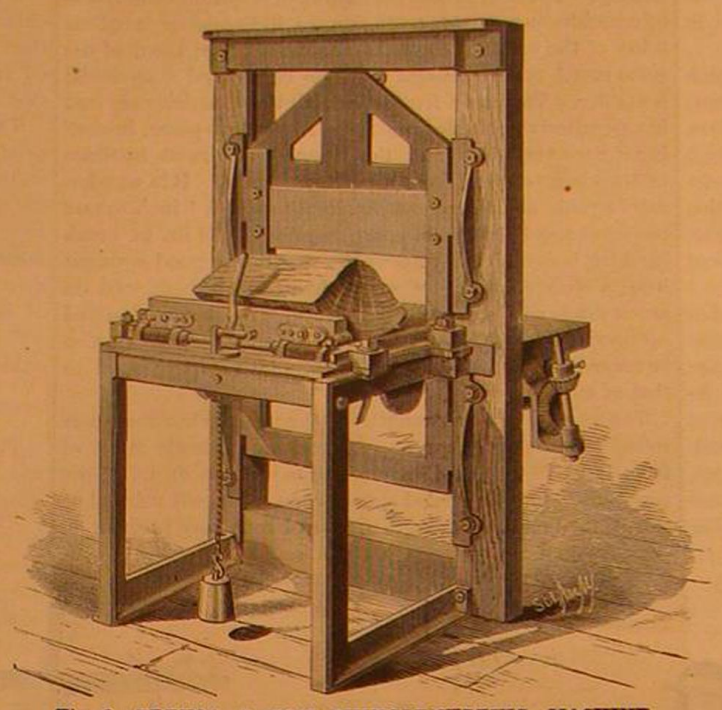


Fig. 2.—TREVOR & CO.'S SHINGLE-CUTTING MACHINE.

The patterns have been designed with the special view of reducing the cost of production, so that it may be sold at a low price. The machine has a balance wheel of good weight, and a very convenient arrangement for shifting the gauge for points and butts of shingles. The saw is well guarded, and it is easily and quickly removed from and replaced in the machine. It takes but very little room, requires little power, and is adapted to the wants of a large class who possess small mills and do a moderate business. It is compact and can be conveniently transported at a distance from railroads, and is well adapted to temporary mills. It is capable of doing a large amount of work, its running parts being very strong for the size of machine. Saws of light gauge can be used, and a saving of timber effected over larger machines.

Fig. 2 represents an improved machine for cutting shingles

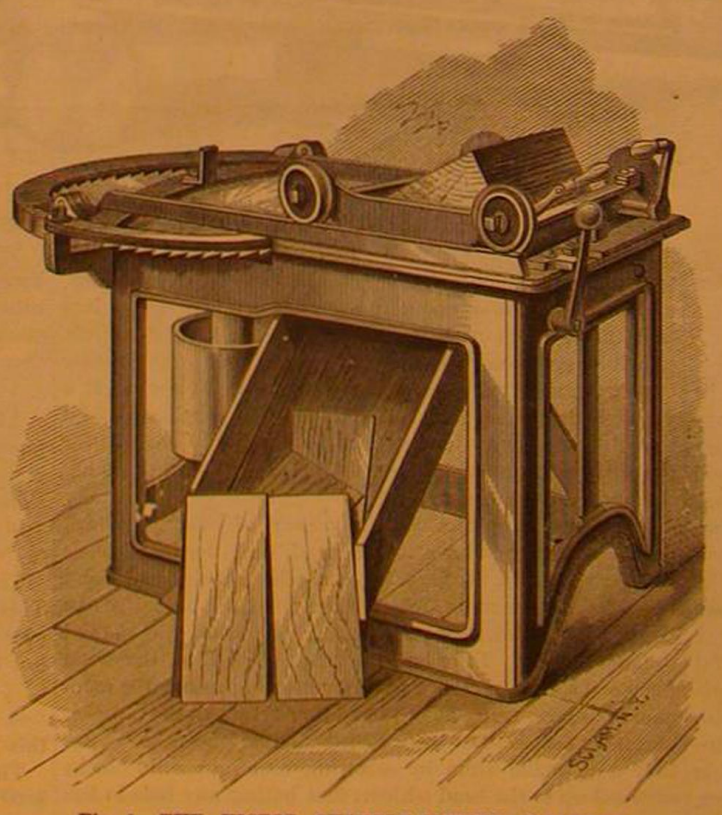


Fig. 1.—THE VICTOR SHINGLE-SAWING MACHINE.

from steamed bolts. The machine has a substantial iron frame, and is arranged with an automatic feeding apparatus and with different racks, by which the thickness of the shingles can be varied, a few minutes only being required for effecting the change, by substitution of one pair of racks for another. It is claimed that this style of machine is superior to the machines with inclined sash or gate; Messrs. Trevor & Co. have patterns for and can build to order the machines with inclined sash. Both machines are operated by means of a pitman connecting the sash to the crank pin in a balance wheel on a counter shaft overhead. There is also a bevel gear on the counter shaft, which operates the feed works through a gear on the upper end of an upright rod, welded to the short upright rod shown in the cut, at the end of the table, at the back of the machine. This machine will cut about 40,000 shingles per day.

JONES' NEW PRESS MACHINE AND PROCESS.

A new pressing machine and sheet tier, invented and patented in this and several foreign countries, by Mr. J. W. Jones, of Harrisburg, Pa., mark a considerable advance in the economical treatment of paper after printing. The tedious handling of the sheets in placing them one by one between fuller or glazed boards before subjecting them to pressure for the removal of the indentations made by the type, is entirely dispensed with, to the great saving of time and space. The printed sheets are folded as they come from the printing press, and are directly subjected to hydraulic pressure in a compact yet powerful machine, and the pressure is retained by simply tying the bundles with cords. In this way a bundle of 500 sheets is pressed and tied up in three to five minutes. In other words the machine and process will dry-press from 6,000 to 7,500 sheets an hour, according to the capacity of the operator. The pressure is applied with two powerful hydraulic pumps, driven by hand or power. The pumps are provided with a safety valve, the beam of which is connected with an electric battery and gong, so adjusted that it can be set for any pressure required. When that is obtained, the gong instantly sounds an alarm. The motion of the plunger or ram is very quick, traveling its entire length in thirty seconds; for practical use it is required to travel only about two thirds its length, or twenty seconds.

The time required for the bundles to stand under the retained pressure is from twelve to twenty-four hours (which time can be considerably reduced by increasing pressure and using stronger cords), when the sheets are completely dry-pressed, all the indentations being removed without set-off. The machine will dry press cut work equally as well as letter press.

Several of these machines are in use in the government printing office at Washington, and are operating satisfactorily. There is obviously a further advantage in the saving of sheets soiled in the ordinary way of pressing and bundling; and the folded sheets are left in better condition for all the subsequent processes of binding. The machines are also suitable for pressing folded writing paper.

Increasing Healthfulness of London.

Recent sanitary improvements in London have had the effect of reducing the death rate so that the average saving of life during the past five years has been upward of 12,000, or nearly 61,000 in all, judged by the death rate of all England. In his annual report for 1878 the Registrar-General says:

"London is the greatest city in the world. Its population exceeds 3,500,000, or, if we add the population of its suburbs in the Outer Ring, the total population is 4,500,000. Its population approaches the aggregate population of 22 other large towns of the United Kingdom. It nearly equals the aggregate population of Paris, Berlin, and Vienna; or, with the suburbs, it equals the populations of the capitals of France, Prussia, Austria, and Russia. The area of this great city is 122 square miles, or a square of a little more than 11 miles to the side; so the density of population is 29,322 people to the square mile, and the proximity of the population is 11·04 yards, or the people are at a mean distance of 11·04 yards from each other. The low rate of mortality in London, if we take its density into consideration, is still more striking than its magnitude. With a density of 29,322 persons to the square mile, the mortality should be 35·2 per 1,000, were not special systems of drainage and cleanliness in use in London, by which the mortality in the years 1874–8 is reduced to 22·8. The consequence is that the deaths are so low in London as 83,695, and the births being 129,184, the registered births exceed the deaths by 45,489, which exceeds the estimated increase of population (43,693) by 1,796. In the seventeenth century the deaths in London equaled the births in number."

Typical Americans.

The court reporter of the Hartford *Courant* was so struck by the proportions of the members of the Grand Jury in attendance on the United States District Court, now in session there, that he had them weighed and measured. Of the nineteen members present only four were less than 6 feet high. Their average height was 6 feet 1⅛ inches, and the average weight 195 pounds. The tallest member was R. B. Craufurd, of Norwalk, 6 feet 4 inches, and the shortest E. L. Chapman, of Tolland, 5 feet 8½ inches.

A Quick Passage from Havana.

The steamship City of Washington, of Alexandre's line, which arrived from Havana, June 25, made the passage in three days and five hours. This is two hours and 45 minutes quicker than any passage she has heretofore made, and is the fastest passage on record between Havana and New York.

Poison Mushrooms.

Mr. J. A. Palmer has a paper on poisoning by mushrooms in the *Moniteur Scientifique*. He states that there are three different ways in which mushrooms may act as a poison. First, they may produce the effects of indigestible matter, as when the hard coriaceous species is eaten; and even the edible mushroom may cause a similar result, for when it is decomposing it gives off sulphureted hydrogen gas in quantity sufficient to induce vomiting. Second, mushrooms may be gelatinous or acrid. Third, a subtle alkaloid, without smell or taste, is contained in some mushrooms, as, for instance, in the group of the amanitæ, and is called amanitin. No antidote has yet been discovered for this poison, and to it most of the cases of death following the eating of mushrooms is due. It is at first slow in its action, but after the lapse of eight to fifteen hours, the patient experiences stupefaction, nausea, and diarrhea. Delirium follows, and then death. Mushrooms containing amanitin will impart poisonous properties to wholesome varieties, if both happen to be placed in the same vessel. The poison can be absorbed by the pores of the skin. Mr. Palmer carried in his hand some amanitæ wrapped up in paper, and, notwithstanding the protection which the wrapper should have afforded, he was seized with alarming symptoms.

THE MARA.

The mara, or Patagonian cavy, as it is sometimes called, is a pretty little animal, which is remarkably swift for short distances, but it is so easily fatigued that it can be run down by a man on horseback. It is more tamable than the agouti, which it somewhat resembles, and is often kept in a state of domestication, being permitted to range the house and premises at will. It is generally found in couples, a male and his mate, occupying the same "form." It does not seem to burrow, nor to keep very close to its retreat. It is fond of crouching in a form like our common hare. It is about thirty inches in length, and about nineteen inches high at the crupper, which is the most elevated part of the animal. At the shoulders it hardly exceeds sixteen inches.

The fur of this animal is soft and warm, and from the contrasting colors of black, white, and golden brown, presents a very handsome appearance.

This beautiful little animal is not found further north than 37°. The dry and stony deserts of Patagonia are its home.

The Spectrum of Sodium.

Mr. J. N. Lockyer, F.R.S., says: I have lately been engaged in studying the spectrum of sodium under new experimental conditions. In anticipation of a detailed communication I take leave to state that the vapor given off from the metal, after slow distillation in a vacuum for some time, shows the red and green lines without any trace whatever of the yellow one. Hydrogen is given off in large quantities, and at times the C line and the red "structure" are seen alone. After this treatment the metal, even when red hot, volatilizes with great difficulty.

SCARUS QUACAMAIA, OR GREAT AMERICAN PARROT FISH.

BY DANIEL C. BEARD.

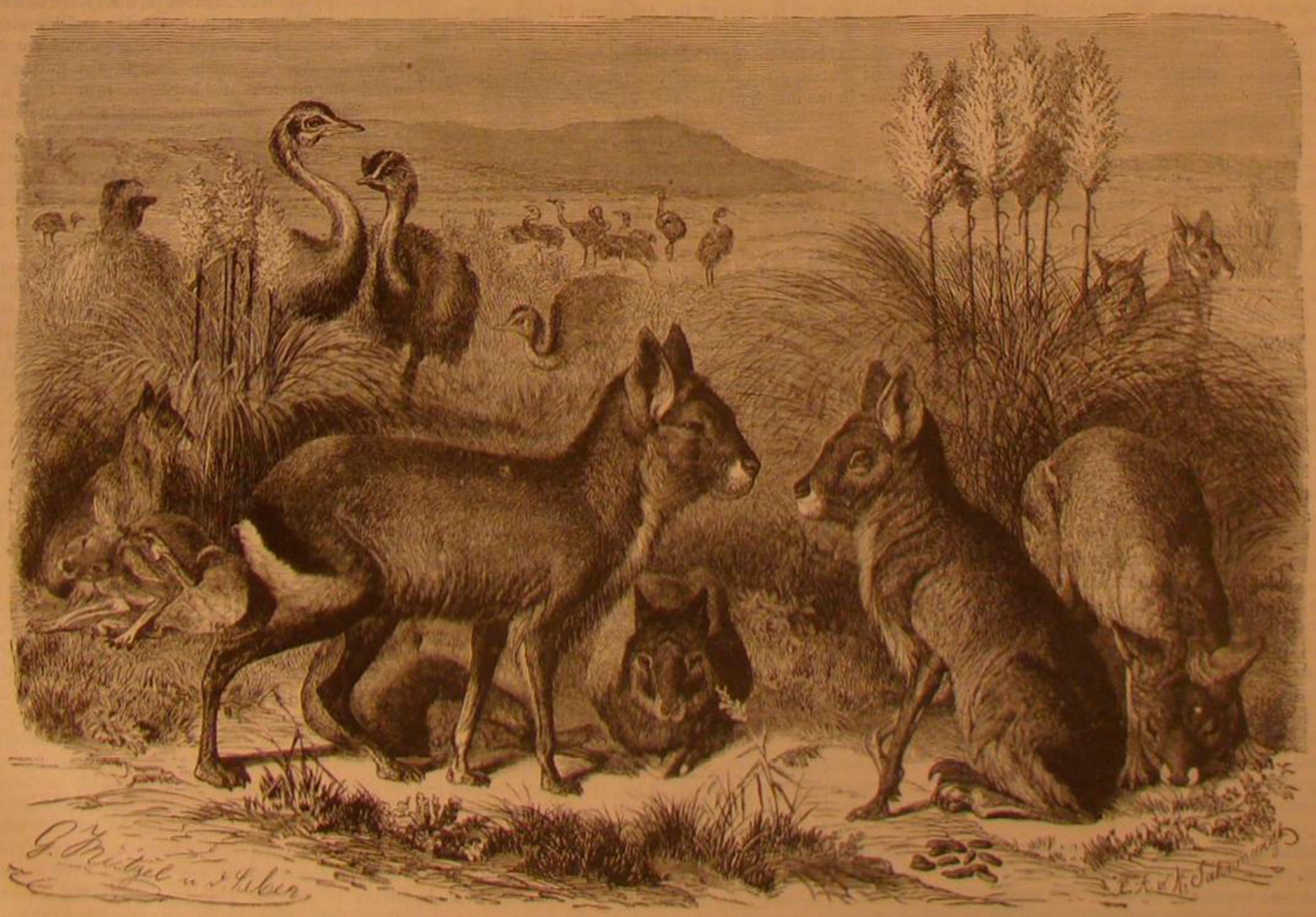
There is probably no more curious and beautiful fish in American waters than the great parrot fish; yet, after having spent nearly a day in a diligent search at the library, the writer was unable to find any account of the *S. quacamaia* beyond the bare mention of the fact that such a fish existed, but there are many careful drawings and accounts of the European *scarus*, a smaller and less elegant creature inhabiting the Mediterranean Sea.

SCARUS QUACAMAIA, OR GREAT AMERICAN PARROT FISH.

The specimen from which the annexed illustration was made came from Campeachy Bay, Mexico, and is now in the possession of Mr. Blackford, of Fulton Market; it measures, from tip of its beak to tip of its tail, three feet one inch, and its greatest vertical width is thirteen inches. In form it is not unlike the common "sheephead;" its dorsal and caudal fins terminate in long points, and the other fins have the same tendency. There are nine spiny and ten articulate dorsal rays; two spiny and eight articulate anal rays. There was no way of ascertaining its weight, but when alive it could have weighed not less than forty or fifty pounds. The most striking peculiarity of this fish is its dental anatomy. Its odd looking mouth or beak is composed of a bony structure of a bluish-green color, excepting the teeth upon the cutting edge, which are white and polished. These teeth, from the inside, have the appearance of being rather long single shafts set edge to edge (see illustration). Upon the outside, however, their compound structure is at once detected; the cutting edge of each jaw is composed of about fourteen irregular scallops or undulations, each of which is composed of about eight well defined teeth, with five or six very indistinct ones as a base. The four teeth which form the rim are white; the four crowded below are tinted with green, making a pretty green and white mosaic work; the green gradually grows darker until it merges into the uniform color of the bony beak or jaw.

The teeth of fishes offer a more striking series of varieties than that of any other class of animals. First, the sturgeon and the whole order of *Lophobranchii* are without teeth; the myxinoids have only a single tooth; and, lastly, are those fish whose mouths are filled with countless numbers of fangs or points, as the pike. The dental organs are always an important and almost a sure key to the habits of an animal; for from the form, construction, and position of the teeth an accurate and definite conclusion can be reached as to the kind of food eaten. So in the curious arrangement of the mouth of the parrot fish we see that the teeth grow in crowds, new ones being always ready to take the place of the old ones that are worn away, from which fact it would be natural to infer that the teeth are much worn in masticating the food, and that the food must be hard. This inference is proved to be correct upon learning that their food is the lithophytes that cover the bottom of the sea like a brilliant garden of many colored flowers. The sensitive little creatures upon which these fish feed, retire, when touched, into their calcareous suits of armor, and the fish must therefore be provided with suitable instruments for either crushing or digging out their prey from their stony coverings.

Although we may laugh in derision at the ignorance and superstition of the ancients when they attribute to the scarus a voice, the habit of sleeping at night and ruminating by day, we must acknowledge that there was some logic in their method of reasoning, for the parrot fish certainly browses upon the corals much after the manner of ruminating animals. Until a comparatively recent date the corals were believed to be vegetables, and the little creatures themselves the flowers. Imagine this beautifully decorated fish with its brilliant hues, sailing through the transparent sea, browsing upon the richly colored corals, among gorgeous anemones and shell fish, and you have a submarine pastoral sketch on which even a Turner might exhaust his palette in colors.



THE MARA.—(*Dolichotis Patachonicus.*)

The Giant Birds of New Zealand.

The Museum of Natural History in Central Park has now within its cases a very perfect series of specimens of some of the most wonderful creatures of prehistoric life yet discovered by science. These are the moas, or monster birds of New Zealand. They occupy a case in the extreme end of the Geological Hall, and owing to their massive proportions, look more like the monstrous remains of different quadrupeds than the sum total of one biped. Even the smallest bones equal or exceed in size the bones of the largest horse. In a recent letter, Mr. C. N. B. Munston says that "a leg bone of a moa, with a large piece of flesh adhering to it, was found some time ago in a cave in the province of Otago, and is now in the Otago Museum, Dunedin, N. Z." This seems to settle the vexed question as to whether the birds are actually extinct or not; but the truth of the statement is strongly contested—Dr. Haast, of the Canterbury Museum, declaring with one party, namely, that the creature has been extinct for hundreds of years, and Dr. Hector, director of the Colonial Museum, that a few moas may yet exist on the grassy slopes of the southern Alps, between the limit of the bush and snow line.

The thought of birds so huge swarming in the low lands suggests the tales of the Arabian Nights, and the "roc" seems almost a possibility. The moas, however, were wingless, and, notwithstanding their enormous strength, were evidently destroyed by man, if we may believe the story of the excavations made by Dr. Haast, which resulted in the fine collection now in the museum.

The place where the birds were first found was almost inaccessible, and when the cavity now called the Moa Bone Point Cave was enlarged by the waves of the sea the estuary of Heathcote Avon in its present condition did not exist. Close to this cavity on its western side was a hard, doleritic lava stream, through which the summer road now passes to the sea. Masses of rock were detached by the surf, forming a ridge which gradually loses itself in the sand.

The formation of this ridge principally took place when this part of the peninsula was twelve or fifteen feet lower than at present, the upper line of bowlders being about sixteen feet above the present high water mark. When the land rose again the sea was cut off by this bowlder ridge from the entrance of the cave, across which lay a huge rock, protecting it and preventing it from being filled up by the deposits of drift sands now forming on the plat close to it. A second and lower line of bowlders was formed in front of the former, about five feet above the present high water mark, with a small terraced space behind it. Since then other deposits forming in the Heathcote-Avon estuary have created a small belt in front of this last line of bowlders, brought into its present condition by the action of the open sea. So it will be seen that nature has done its best to protect this treasure. Notwithstanding the constant changes of land and sea, the cave retained its individuality, the huge rocks and ledges thrown across its mouth by the fierce waves completely guarded its entrance, and repelled the invasion of the elements.

The entrance of the cave in which were found the remains is about forty feet from the summer road, which has an altitude of 1,859 feet above high water mark, and is nearly 5 feet lower, or 1,854 feet above high water, taking the level of the surface as a guide. An opening, which is about 30 feet broad by 8 feet high, much narrowed, however, by a huge rock, leads into the cave, of which the floor slopes gently down. The cave consists of three compartments, of which the first one is by far the largest. It runs nearly due north and south, is 102 feet long by 72 feet wide toward the middle, and about 24 feet high. From this cave's termination through a small passage, a second cave is reached, which is 18 feet long and 14 feet wide, and about 11 feet high, its direction being north by west to south by east. At its southern end a small passage, 3 feet high by about 2 feet 6 inches broad, leads into a third or inner chamber, which is more than 22 feet long, with an average width of 16 feet, and about 20 feet high, running like the principal cave, due north and south. Its floor is about 8 feet above high water mark.

Near the surface, and trodden in, lay many objects which showed that the cave had been inhabited as a dwelling place at some remote time. This entire stratum was removed by a systematic digging of trenches by the natives under the direction of Mr. Haast, and among the objects recovered were (1) cockle, periwinkle, and muscle shells common in the neighboring estuary; (2) a layer of ashes with pieces of flax, cabbage tree leaves, charred wood, etc; (3) ashes and dirt beds composed of the dropping of goats and cattle, introduced into Canterbury by the Europeans in 1839, and a few pieces of moa bones; (4) a layer of agglomeratic beds consisting of rocks that had evidently fallen from the roof. Between the layers of shells were found pieces of wood, partly charred pieces of wooden implements of Maori manufacture, plaitings made of *Phormium tenax*, and pieces of two broken polished stone implements, while close to the bottom of the trench moa bones were found representing several species. Mr. Haast, in noticing this, says: "I could not divest myself of the conviction that in and below the agglomeratic beds remains proving human occupancy would be found."

In a few days the men turned over a deposit covering an area about 20 by 30 feet wide, and advancing in a southwesterly direction, found the remains of a monster bird. The massive limbs, larger than those of the heaviest ox, had evidently been broken to extract the marrow. Evidences of industry were not wanting, as pieces of timber polished and planed down by stone implements, and upon one a red coating was still visible. Among the other objects of wood exhumed were several pieces of "toa," a thin and long wooden spear made of "tarra," a tree that only grows in the northern part of the Northern Islands. This spear is used by the Maori natives for shooting birds. For this purpose they form, as it were, a short tube around it with one hand, through which, after taking aim, they propel the thin spear suddenly with the other. The greatest part of a whaka-kai, a wooden disk made of pukatta, used for placing fat birds in so as not to lose the oil, or for the preparation of the juice of the topahulie, and many more implements of household use, were also found.

In this search human remains were not found, and it was not until two or three strata had been removed that they were discovered; but at last a Maori skeleton was found a few feet from the southwest wall. The aborigines who placed the body there had dug through the shell bed about 8 inches, then through the dirt 2 inches, and 4 inches through the agglomeratic deposit. They had then excavated the marine sands for several feet and placed the corpse in a sitting position, bound with flax, the face toward the wall of the rock. It was evident that the burial had taken place long before Europeans came to the place. The skeleton, which was articulated by Mr. Fuller, stands in the Canterbury Museum, and belongs to a man past middle age, and more than six feet in height. The ulna of the left arm was broken, and was only partly healed when he died; and letting imagination run rife, we can suppose that he was killed by the blow of a moa's "hoof"—an unbirdlike term, but appropriate to the facts of the case.

Judging by the molars of this unfortunate Maori, moa on toast was by no means a tender dish, as the teeth were worn and twisted into almost Quilpian ugliness. Most of the premolars were missing in the lower jaw, the alveoli (tooth socket) being quite absorbed. In the upper jaw, the first molar on the right side and the first on the left are twisted upward, their anterior surfaces adhered to the alveoli, which were developed in a slight bony outgrowth. Owing to a very remarkable distortion of the left molar, mastication was performed with its outer surface, which was worn. The condition of this specimen, its evident age, and that of the surrounding objects, points to the truth of the theory of Mr. Haast, that the dinornis became extinct at an extremely remote period.

The birds were found in many positions. Some in swamps where they had herded together in their flight, and like the mastodon, had been swallowed by the soft ooze that was to perpetuate their name in future ages. The natives now living attribute the first Maori to the Wattaha, the first immigrants who preceded the natives called Ngalimamoe, who preceded Ngotekwu, the present inhabitants. The fact that these remains are assigned to a remote period of Maori occupation by the natives themselves, considered in connection with the great distance between the lower and upper shell beds, goes far to prove that many centuries must have elapsed since the moa became extinct.

The fine collection of these huge creatures now at the Park represents a variety of genera. They were set up by Dr. Haast, and the trustees of the American Museum purchased them by telegraph, outbidding the agent of the British Museum. It is the most perfect collection extant. Their huge forms certainly tell a wondrous tale of the degeneracy of power in the march of time.—*C. F., in Evening Post.*

Petroleum.

The amount of crude petroleum produced has been steadily increased, with only two exceptions, from year to year, until it has reached 7,149,778 barrels in the first five months of the present year. At the same ratio for the balance of the year a production of 17,500,000 barrels will be obtained in 1879.

The rate of increase in the production has been, up to the present time (June 1st), about 315 per cent. The question of controlling the production has for all these years been one of the greatest importance to the trade; but all plans proposed and all attempts made in that direction have thus far proved ineffectual in restraining the producers from opening up new territories and producing the oil wherever found, without regard to the law of supply and demand, which every good business man is bound to respect and ready to apply in all other pursuits of life.

Taking it for granted that the production cannot be reduced while the Bradford field with its flowing wells tempts the operator, also while West Virginia, Kentucky, Tennessee, and California are attracting both the capitalist and the operator to their wonderful petroleum fields, which promise to rival Pennsylvania in the production of petroleum at no very distant day, it is apparent that the attention of all parties interested in the trade should be turned to and concentrated upon increasing the consumption of the product.

As a result of careful computation it has been ascertained that the exports of petroleum from the United States constituted about 66 per cent of the production, and that the home consumption required about 22 per cent more, making the total consumption 88 per cent of the production for the year 1878, leaving a surplus of 12 per cent. By concentrated action on the part of producers, shippers, and dealers, having in view the increase of consumption at home and abroad, the 12 per cent surplus, which is now increasing, the stock would soon be worked off at paying prices and a sound continuous market be secured for our present large production and to cover any increase in production that is likely to be obtained in the future.

A very important point to be considered in increasing the consumption is new uses to which the article may be applied; not forgetting, however, that its present uses as an illuminator, lubricator, and for fuel purposes should be extended and increased at home and all over the habitable globe.

The number of producing wells at the close of May was 11,045. Total production in May, 1,621,672 barrels. Daily average for the month, 52,312 barrels.

The shipments in May out of the producing regions were 195,281 barrels more than in the preceding month. The total shipments of crude, and refined reduced to crude equivalent, by railroad, river, and pipes to the following points were 1,331,469 barrels:

New York took	886,818 bbls.
Pittsburg "	108,456 "
Cleveland "	112,280 "
Philadelphia "	131,479 "
Boston "	8,328 "
Baltimore "	40,627 "
Richmond "	
Ohio River refiners took	13,161 "
Other local points "	30,410 "
Total shipments	1,331,469

Included in the above shipments there were 128,149 barrels of refined from Titusville and Oil City, which is equal to 192,377 barrels of crude.

The stock in the producing regions has been increased during the month 290,203 barrels, making the total stock at the close of the month 6,956,814 barrels, and is held by pipe companies, tankers, and operators.—*Stowell's Petroleum Reporter.*

The Water Tower.

This invention of Mr. Logan, a practical machinist of Baltimore, having been brought to the attention of the New York Commissioners, they invited an exhibition in this city, and Chief Bates was instructed to furnish every convenience for a thorough test of the apparatus. The test was in every way satisfactory, and all who witnessed the operation of the machine, says the *Fireman's Journal*, expressed the opinion that it was a practical and desirable adjunct to fire departments.

The water tower consists of three sections of iron pipe mounted on a truck; these sections being fitted together horizontally are raised to a perpendicular position by turning a wheel, an operation easily performed by one man; at the upper end of the tower is a flexible play pipe, to which was affixed a 1¼ inch nozzle; at the base of the tower are connections for two lines of hose. Engine No. 20 was at a hydrant at Washington Square, and connected to the tower by two lines of hose. When water was first put through the hose, a coupling flew off and had to be sent to the repair shop to be readjusted. Meantime the steamer played through one line of hose, a splendid fire stream being projected through the tower, the nozzle of which was fifty-one feet above the ground. One man on the truck had perfect control of the stream, and by means of a simple gearing was able to depress or elevate the stream, or turn it in any direction, sweeping the horizon at all points and freely sprinkling the promiscuous crowd that had assembled. At a height of twenty-eight feet a branch pipe is placed and two streams were thrown at the same time, being handled with equal ease and facility by one man. Subsequently the tower was lowered and a short section substituted, having a 1½ inch nozzle and a height of thirty-seven feet. Two lines of hose were connected, and two streams thrown from the tower to a great height and a great distance horizontally.

The ease with which the machine was handled and its effectiveness excited the admiration of all beholders. Firemen, especially, were enthusiastic regarding it, but wanted to see one seventy instead of fifty feet high, and a 2 inch nozzle substituted for the smaller one. The advantages offered by this machine are the getting of a solid stream high in the air before it leaves the nozzle without the aid of ladders, and the ease with which it is controlled by one man. Of course no greater power is exerted than is furnished by the engines, but half a dozen streams could be siamesed into it if necessary. At the test the highest water pressure obtained was 170 pounds, while the owner claims that the tower will sustain a pressure of 300 pounds at the nozzle. As Commissioner King remarked, a 2½ inch stream delivered at that height under such pressure would be bound to make a black mark on any fire against which it was projected. It would also be of great value in "wetting down" buildings contiguous to a fire, as its range would enable it to sweep both sides of the street and keep the buildings wet from curb to cornice.

The Electric Light in Mining.

The first electric light employed in our Western mines was placed on the Deer Creek placer claim of the Excelsior Water Company at Smartsville, Nevada, on the 10th of last April. A 12,000 candle power Brush machine was put in operation, and three lights of 3,000 candle power each were placed in prominent positions upon the claim. Although the night was very dark the lights shed a brilliant light around and enabled the miners to work as readily as during the day. Until this experiment the mines had to shut down during the night, but now the company expects to work both night and day. Nevada and Yuba counties have many hydraulic mining companies, and several of them have announced their desire to use the new light if the Excelsior Company is thoroughly satisfied with their machine. The cost of lighting the claim by electricity is said to be 16 cents an hour.

A Powerful Spectroscope.

In the young science of spectroscopy, as in others, an important element of progress is the improvement of instruments for dealing with the phenomena presented, and many minds are engaged on this. A new spectroscope of remarkable power has just been brought to the notice of the French Academy by M. Thollon. Its chief feature is the use of sulphide of carbon prisms, which are closed laterally, not by plates with parallel faces, but by prisms of the form of Amici's—*i. e.*, having curved sides meeting at an angle which, however, is much smaller than Amici's prism). The refringent angles of these prisms are in an opposite direction to that of the sulphide prism. Two of these compound prisms are substituted by M. Thollon for the simple prisms in a spectroscope, which he formerly described to the Academy. Without going into further details, we may simply state that an enormous dispersion is obtained; with a magnifying power of 15 to 20 times, the spectrum has a length of 15 meters. The angular distance of the D lines of sodium is about 12', whereas that produced by M. Gassiot was only 3' 6". This instrument should throw considerable light on the structure of the spectrum, and M. Thollon has already noticed some interesting facts. The lines of sodium and magnesium present a dark nucleus passing into a nebulosity, which becomes gradually merged in the continuous spectrum. Many lines have been split up, and all that have been thus resolved have been found to belong to two different substances. One of the hydrogen lines presents a nebulosity without a nucleus. M. Thollon remarks on the magnificence of the spectrum of carbon from the electric arc, observed with the new instrument. The spectra of iron, copper, and magnesium in the same arc were also seen with admirable clearness and brilliancy. These new spectroscopes have been constructed for M. Thollon by the able optician, M. Laurent.

Lighting the Capitol by Electricity.

The arrangements for lighting the capitol building with a new electric light are nearly completed. The experiment has already been made in the hall of the House of Representatives, and a single light placed on the front row of the reporters' gallery and over the Speaker's chair made the whole hall so light that print could be easily read at the points furthest from the burner. The plan is to place four lights in the hall, and it is now believed that they will be a very great improvement upon the present arrangement of gas burners.

Three electric machines have been purchased under the appropriations for lighting the interior of the building, and it is in contemplation to place another in position for the purpose of supplying a light of vast power upon the top of the dome. It is claimed by the inventors that a burner can be constructed there which shall have a very appreciable effect upon a large area of the city. It is claimed that with the steam power of the heating and ventilating apparatus in each wing of the building, a dynamo-electric machine of 175,000 candle power can be run.

Purification of Water.

During the hot weather, says the *Brewers' Guardian*, great care should be taken to insure a supply of pure water for brewing. Many of the organic contaminations which are quiescent and harmless in winter, become dangerously active in hot weather. Unless the water is naturally very pure, it should be artificially purified by filtration. Sand will mechanically remove impurities, but more than this is required, animal charcoal is perhaps the best filtering medium, but even this material will not completely remove all impurities. A quantity of scrap iron placed in the water will most effectually remove organic matter, but the water must necessarily be subsequently passed through a bed of sand and gravel to separate all the oxide of iron which is formed.

Welding of Nickel and Cobalt to Iron and Steel.

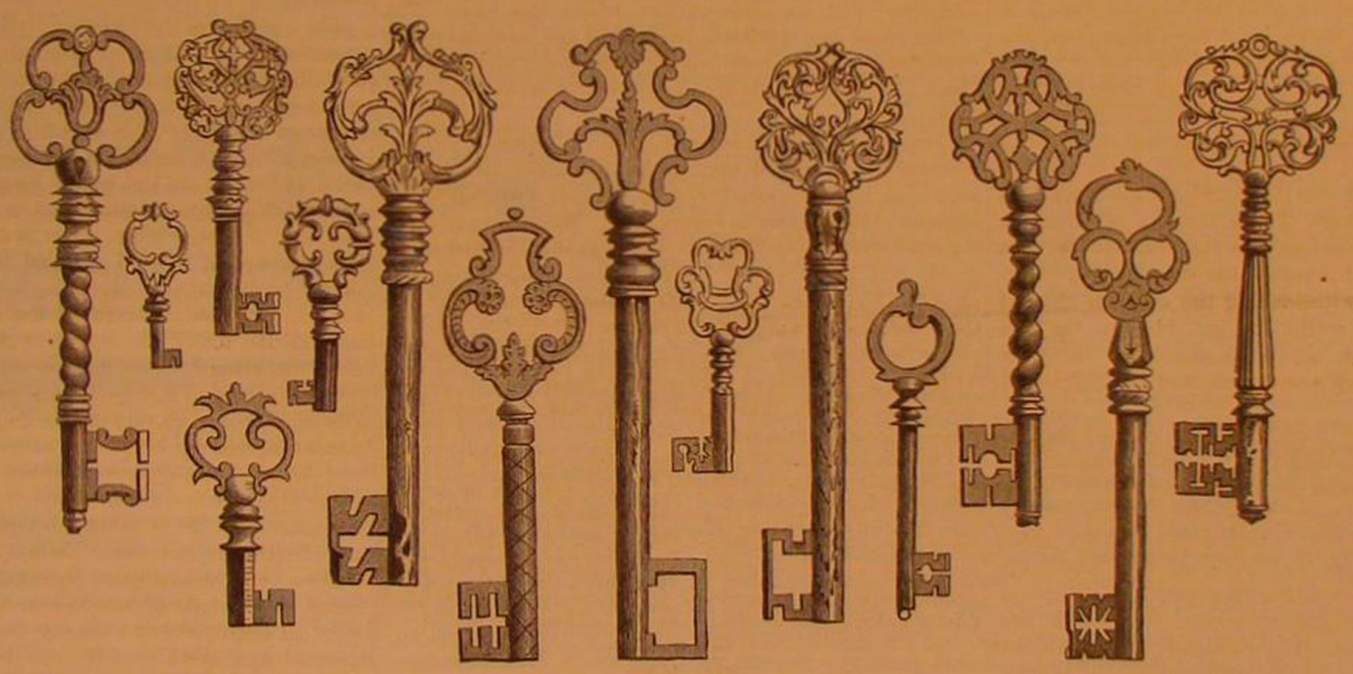
Herr. Fleitmann has succeeded in obtaining cast nickel in a malleable and ductile form, while cobalt prepared in the same manner possessed such hardness when cold that he thinks it could be used for cutting instruments, while hot it is both malleable and ductile. His process consists in adding to the fused metal, through a hole in the lid of the crucible, ½ per cent of metallic magnesium, which possesses a remarkable power of destroying carbonic oxide. Cobalt prepared in this manner possesses none of the reddish color attributed to it in the text-books, but excels nickel in whiteness and brilliancy. He also welded these metals to iron and steel at a white heat, and strips thus welded were rolled out to the finest number without separating from each other.

Advice to Bathers.

With a view of diminishing the loss of life which annually occurs from drowning, the Royal Humane Society of England issues the following seasonable advice to bathers: "Avoid bathing within two hours after a meal, or when exhausted by fatigue or from any other cause, or when the body is cooling after perspiration, and avoid bathing altogether in the open air if, after being a short time in the water, there is a sense of chilliness, with numbness of the hands and feet, but bathe when the body is warm, provided no time is lost in getting into the water. Avoid chilling the body by sitting or standing undressed on the banks or in boats, after having been in the water, or remaining too long in the water, but leave the water immediately there is the slightest feeling of chilliness. The vigorous and strong may bathe early in the morning on an empty stomach, but the young and those who are weak had better bathe two or three hours after a meal; the best time for such is from two to three hours after breakfast. Those who are subject to attacks of giddiness or faintness, and who suffer from palpitation and other sense of discomfort at the heart, should not bathe without first consulting their medical adviser."

ANCIENT KEYS.*

The engraving shows several keys from the Munich National Museum which belong to the 17th and 18th centuries. They are drawn half real size by Professor C. Reiss, of Stuttgart. The locksmith's art which, at the expense of decorative treatment, is almost entirely absorbed in our days by the complication of mechanism, showed itself formerly most particularly in the artistic form of the key. We find everywhere in museums and collections of industrial art a great number of specimens of most elaborate and delicate workmanship. This domain of small art, however restricted, is well worthy of attention.



KEYS FROM THE MUNICH NATIONAL MUSEUM.

Economical Steam Engine.

The Corliss engine at the French Exhibition of 1878 consumed only one kilogramme (2·2 lb.) of coal per horse power per hour. A similar engine of 700 horse power, constructed by M. Farcot, for the drainage at Asnières, consumes only six tenths as much. M. Tresca, in recommending, on behalf of the committee of the French Academy, that the Montyon prize should be awarded to the inventor of this engine, stated three special advantages which it possessed: A form of construction which establishes a great firmness between the cylinder and the chief arbor, with the least consumption of material; the separation of the orifices of admission and emission, to the great advantage of the permanence of temperature in the steam at its entrance into the cylinder; and a system of distribution commanded by a central platform for the four openings by means of springs and cams, which secure the opening and closing of the orifices. While claiming for Cavé the principle of separation between the orifices and conduits of admission and escape, the committee consider that Corliss' applications of the principle, the precision of action, and the economy of his engines entitled him to the Montyon prize of one thousand francs, and the Academy awarded the prize accordingly.

* From the *Werkshop*. Willmer & Rogers News Company, agents, 31 Beekman street, New York.

On Public Speaking.

It may perhaps be of use to those anxious to become orators to know that from some cause or other almost all speakers occasionally not only lose the thread of their argument, but lose all knowledge of what they are talking about. I have seen this occur, says a writer in one of our English contemporaries, with many of our most experienced orators. When it happens they repeat a few vague generalizations until their thoughts come back to them, and then they fall back again into their speech. Thus their temporary wool-gathering escapes detection, except by those who watch them very closely. An inexperienced speaker, instead of doing this, pauses, gets confused, and sits down in despair. Another great mistake of budding speakers, and indeed of many who are in full bloom, is to speak too quickly. A person who wishes to be heard can hardly speak too slowly. He should pronounce not only each word, but every syllable of each word distinctly. Mr. Bright once said that nothing had cost him more trouble than to learn to speak slowly. A clear, deliberate utterance of every syllable, with pauses to mark the stops at the end of each sentence, does not produce the effect of tediousness, but the reverse.

A Long Trance.

The *British Medical Journal* reports a notable case of trance in the London hospital. The patient is a woman twenty-seven years of age, of rather small stature, and weak mental capacity. She was admitted on April 3, on account of symptoms connected with extensive disease of the heart, for which she had been treated as an in-patient in 1877. When admitted there was marked aphonia; she complained of great precordial pain, and frequently expressed her firm idea that "she was going to be married." At this time she had no difficulty in taking liquids; no marked nervous symptoms were present beyond the loss of voice. About May 7 prostration became marked, without any signs specially attributable to the heart disease, and she evinced great disinclination to take food of any kind. In a few days she fell rather suddenly into a state of trance, in which condition she has remained ever since. At first she could be induced with difficulty to take liquids, but soon she would not swallow even such food, and nutrient enemata had to be given. For a few days she would reply to questions by monosyllables, but later gave no sign of consciousness, remaining perfectly passive and motionless, and could not be roused. There was never any kind of convulsive seizure, local paralysis, or sign of any further lesion connected with the heart disease; the pulse remained full throughout. No reflex action was obtained on tickling the feet, and she seemed quite insensible to pricking or pinching the skin. The temperature remained normal. For three days she was fed by an elastic catheter passed through the nostrils to the pharynx—a proceeding which she made some attempt at resisting.

This condition differs from catalepsy in its lifelessness; but for the performance of the organic functions there is no muscular rigidity; the limbs, when raised, fall as if lifeless, and, if placed in certain attitudes, are not retained fixed as in catalepsy. At present the patient remains in the state described, giving no signs of consciousness; her condition appears to be exactly that of the famous Welsh fasting girl, and there is no sign of special disturbance resulting from her heart disease.

PHOTOGRAPHIC RIFLE.—M. Marey having expressed a wish for the invention of a photographic rifle which could take instantaneous views of birds in their flight, Capt. Eugene Vassel proposes a small dark rifle chamber of 2·27 inches interior diameter, surmounted by a proper level and sight. By means of Muybridge's, Janssen's, or other contrivances for taking instantaneous pictures, he thinks that small views might be easily taken which could be subsequently enlarged. He also proposes a photographic revolver for taking a series of successive attitudes at a single operation.—*La Nature.*

Cotton Mills in South Carolina.

One of the most hopeful features of Southern industry is the effort making there to break up its purely agricultural character. A correspondent of the *Times*, who has been visiting the cotton mills of South Carolina, says that the advocates of Southern home industry are justly elated over the gratifying reports from the cotton mills in that State. Despite the general depression in business from various causes, among them yellow fever, last summer, the cotton goods increased in quantity and improved in quality, and found ready sales. The chief obstacle in the way of success was the scarcity of competent operatives, but with the aid of a few taken from Northern mills, a sufficient number of young native women and men have been taught to feed and direct the machines. They are furnished with neat cabins in the vicinity of the mills, and their pay ranges from 26 cents to $3 a day, according to their usefulness. The increase of local sales is specially noteworthy. The Piedmont Company's books show the following profits on sales for the fiscal year ending March 31, 1879: New York, $9,401.58; Boston, yarns, $10,619.64; Baltimore, $7,180.12; local, $24,320.04; all other sources, $5,163.46. This, in proportion to the size and capacity of the other mills, is a fair exhibit for all.

The Langley Manufacturing Company was incorporated in 1870, with a capital of $450,000. Its mill is in the town of Langley, Aiken County, on the Charleston and Augusta Railroad. The main building is 229 by 104 feet, and the water power is equal to 580 horse power. The 10,880 spindles and 328 looms are operated by 325 mill hands. Four hundred and fifty bales of cotton are consumed monthly, which produce, on the average, about 598,000 yards of shirting, sheeting, and drilling. The president, W. C. Sibley, reports the trade brisk and prospects very encouraging.

The Glendale Mill, situated on the Enoree River, about six miles east of Spartanburg, is owned by a private firm, consisting of Messrs. Converse, Zimmerman & Twichell. The main building is five stories high, and measures 130 by 50 feet, and the side building is 60 by 40 feet, and three stories high. The mill consumes 40 bales of cotton weekly, and produces 50,000 yards of shirting, sheeting, and drilling during the same period. Five thousand spindles and 120 looms are daily fed and attended by 125 operatives. The water power at low water is estimated as equal to 250 horse power. Most of the goods manufactured during the fall, winter, and spring months are sold at home, but during the summer months the greater portion is shipped North and West. The present handsome structure was erected soon after the war in place of the old tumbledown factory which had occupied the site for 22 years. In reply to inquiries concerning business prospects, Mr. Converse said: "Trade has been better thus far this season than it was for five years. Up to May 1 we were ahead of production all the time, a great many of our goods being taken for export. We have about caught up with our orders, but have no accumulation."

The Reedy River Manufacturing Company's mill is on Reedy River, about four miles east of Greenville. The machinery is limited to 2,000 spindles and 48 looms, which, attended by 50 operatives, produce daily 2,500 yards of sheeting and 300 pounds of yarn. This company was organized in 1875 with a capital of $47,500. Its trade is almost entirely local, and, according to the superintendent's statement, very lucrative.

The Graniteville Manufacturing Company was organized in 1855. The advocates of home industry were less numerous at that time than they are now, and the company experienced some difficulty in obtaining a charter. Their establishment is situated on Horse Creek, in the town of Graniteville, and employs 240 operatives. The mill consists of 10,000 spindles and 300 looms, which produce monthly 360,000 yards of sheeting and drilling from 148,000 pounds of cotton. The water power is equal to 350 horse power. A short time ago the company also purchased 2,200 acres of land, and the water power used by the Vancluse Mill, burned in 1874, and built a new mill of granite and brick, which is being rapidly supplied with the most approved machinery, and will soon commence operations. The dam for this new mill is built of granite, and measures 342 feet in length. The expenses for the latter were paid from surplus funds and without an increase of the capital stock—which is $600,000. President Hickman reports trade very good for the season.

The Piedmont Manufacturing Company was incorporated three years ago with a paid in capital of $335,000. Its mill is on the Saluda River, on the Greenville and Columbia Railroad, about eleven miles from Greenville. Seventy-six snow white cottages, surrounded by neatly fenced gardens, inhabited by 275 operatives, line the main approach from Greenville for nearly half a mile, and present a very pleasing sight. The main building, containing 12,300 spindles and 380 looms, is three stories high and 256 feet long. About 18 bales of cotton are daily consumed, which produce, on the average, 16,000 yards of cloth and 2,300 pounds of yarn. The water power is unusually fine. It has been estimated that a pressure of 42,000 cubic feet of water per minute can be easily obtained, which would be amply sufficient to work 100,000 spindles. The company's books on March 31, 1879, exhibited surplus assests over all liabilities amounting to $36,869, and $56,684 gross profits for the preceding twelve months. Plans have been drawn and preparations are being made to erect another building without delay, which is to contain room and machinery for 15,000 more spindles.

The Camperdown Manufacturing Company commenced operations in 1874, with a capital of $300,000. Its machinery is distributed in two buildings—one two stories high and 206 feet long, and the other three stories high and 100 feet long—which are situated on Reedy River, almost in the heart of Greenville. The 13,000 spindles, attended by 260 operatives, produce, on the average, about 36,000 pounds of yarn weekly, from 100 bales of cotton. The mill produces a very superior yarn, much sought after in local markets. Bleaching and dyeing establishments—novelties in this section—have been recently added with gratifying results. Mr. Sandford, superintendent, reports business satisfactory.

The Westminster Thread Manufactory is owned by a machinist named Stribling and a few well-to-do farmers residing in the vicinity of Westminster—a small station on the Air Line Railroad, in Oconee County. They commenced operations about one year ago, in a two story wooden building, with a small capital. The machinery used is known as the Clement attachment, which transforms seed cotton into very superior thread. Various superiorities are claimed for this invention which are open to doubt, but nobody can dispute its labor-saving qualities. The laborious task of ginning and packing the cotton after it is picked is entirely dispensed with. The local demand exceeds the mill's production.

In addition to those already named, there are two more—the Saluda and Batesville factories: the former is near Columbia and the latter at Batesville, Greenville County. They produce about the same quantity and quality of goods as the Reedy River Mill. Both appear to prosper.

The Future of Copper Mining in New Mexico.

A correspondent of the New York *Times*, writing from New Mexico, says that an investigation of the copper resources of New Mexico leads to the belief that the depreciation in the value of copper which will follow the development of New Mexican mines will practically exclude the other mines in the United States—if not, indeed, the most of those in the world—from competing with that Territory.

One of the richest deposits is at Clifton, 93 miles almost due west from Silver City and between 60 and 65 miles from Ralston, now possibly better known as Coronado. The ore seems almost unlimited in quantity—in fact, there is a solid mountain of copper. To prove this, the first development was by tunnel at the base, and from which drifts were carried in all directions, shafts in the meantime being sunk from above, the ores from the top showing fully as rich as those at the bottom.

The smelting works and attendant buildings are in a cañon on the Fresco River, near where it empties into the Gila. Fuel has to be brought 35 miles and costs $40 a ton, one and a half tons being required to smelt a ton of copper. Cartage to the nearest railway station at Otero costs $70 a ton; yet the business is carried on at a large profit.

At Santa Rita, near Silver City, are extensive copper deposits, which have been worked for over a hundred years. While yet Mexican territory these mines were worked mainly by convict labor, and at times by hired natives. The deposits are of various kinds of copper ore and native copper in the seams of the rocks. It was for the latter that mining was carried on in former years. There is an abundance of rich ore over a large district, but at present the mines are in the hands of speculators and not being worked. The extreme difficulty of getting transportation for the metal to the end of the railroad has also, no doubt, had an important bearing upon the cessation of labor upon the mines. The ores of the Santa Rica and Hanover districts adjoining are in the form of immense deposits, and while rich, are unlimited in quantity. Further west, the Burro Mountains contain large deposits of copper, and still further, at Coronado, are several mines of great magnitude, of low grade ores, which cannot be worked at present for want of fuel and water. Up the Valley of the Rio Grande, and 18 miles east of Bernadillo, which is hardly more than 250 miles from the Colorado boundary, is the great copper district of the Puerto. Westward, and beyond the territorial line into Arizona, are copper deposits of much magnitude.

Quantity of Material in Buildings.

According to the *Northwestern Lumberman* 1,000 laths will cover 70 yards of surface, and 11 pounds of nails put them on. Eight bushels of good lime, 15 bushels sand, and 1 bushel hair make enough good mortar to plaster 100 square yards. A cord of stone, 3 bushels lime, and a cubic yard of sand will lay 100 cubic feet of wall. One thousand shingles, laid 4 inches to the weather, will cover 100 square feet of surface, and 5 pounds of nails fasten them on. One fifth more siding and flooring is needed than the number of square feet of surface, because of the lap in the siding and the matching of the floor. Five courses of brick will lay 1 foot in height on a chimney; 6 bricks in a course will make a flue 4 inches wide and 12 long; and 8 bricks in a course make a flue 8 inches wide and 16 long.

Depth of Earthquakes.

The recent earthquake at Virginia City was not noticed at all in the mining depths, but only by people on the surface. Their famous earthquake of some years ago, which shook down chimneys, fire walls, cracked brick buildings, and did other damage, was merely noticed by some of the miners working in the upper levels, but it did no damage, not even shaking down loose stones and earth. The station men in the various shafts felt it the strongest, and the deepest point where it was noticed was by the station tender at the 900 foot level of the Imperial Empire shaft—900 feet below the surface. He said it felt like a sudden faint throb or pulsation of the air, as though a blast had been let off somewhere at a distance, above, below, or in some indefinite direction. In some of the mines the shock was not noticed at all, even by the station men. Commenting on this peculiar fact at the time, the Gold Hill *News* remarked that the earthquake seemed to be an electrical disturbance proceeding from the atmosphere and not from the depths of the earth.

Canal across the Isthmus.

The formation of a company to construct the great interoceanic canal across the Isthmus of Darien has been commenced. Of course M. De Lesseps is the prime mover. A first subscription of 4,000,000 francs is to be opened simultaneously all over the world next September. M. De Lesseps is confident that the amount of first subscription, 10 per cent of which is to be paid upon subscribing, will be more than covered. The charter of a company which has entered into arrangements with the Panama Railroad, and has obtained certain concessions from the Colombian Government, will be purchased as a preliminary measure. Mr. Nathan Appleton will be a director, and will open subscriptions in this country. It is the purpose of the company to make the loan a popular one, dispensing with government aid entirely. As at present contemplated, M. De Lesseps will, on the 1st day of January, 1880, break ground for the grand work of engineering.

The *Railway Review*, from which the above is taken, adds the following doubt regarding the success of the scheme:

We wish we might grow sanguine over the announcements, but we can only express hopefulness of the ultimate success of the enterprise. We know nothing of the arrangements made with the Panama road, alluded to above, but think it doubtful, if the real obstacle, the indemnity due the railroad, has been overcome. The contract existing between the road and the Colombian Government stipulates that no maritime canal to connect the two oceans shall be constructed without the concurrence of the railroad company. At least it amounts virtually to that, for it provides that such canal shall not be constructed in opposition to their wishes, without the payment to the company of a sum sufficient to indemnify them for damages and to pay them for their privileges as carriers on the Isthmus. If the sum demanded be deemed excessive a board of arbitration is provided for, the government to select one arbitrator and the railroad company another. In case of a failure to agree, the two arbitrators will select a third, whose decision will be final. An equitable arbitrament would, however, be unable to arrive at anything but an enormous figure, as, though the road would undoubtedly profit during the construction of the canal, after its completion its future would be distressingly problematical and millions of money would be irretrievably lost.

Electro-Measurement of the Hardness of Steel.

A new apparatus has been produced by Professor Wattenhofen, of Prague, for measuring the hardness of steel electro-magnetically. Its principle is that hardness of steel may be very correctly inferred from a numerical determination of its coercitive force. In its main features, his arrangement is as follows: From one end of a balance arm are suspended successively, in a brass holder, bars of the steels to be examined—those being as nearly as possible equal in weight. The other arm bends obliquely downward, and bears a constant weight. Motion of the beam causes a pointer to move radially over a scale, the movement being magnified by toothed wheels. One of the steel bars having been suspended, a magnetizing coil, equal to it in length, is raised on a stand so as to inclose the bar, and fixed with a binding screw when it does. Then a current is sent through the coil; then the coil is released and moved gradually down, pulling the bar with it, till the latter breaks away, and the deflection of the pointer is noted at which this occurs. This affords an estimate of the hardness of the steel. For example, a bar, A, gives a maximum attraction, 9·6; a second bar, B, 15·5; a third, C, 14·6. It is inferred that A is considerably harder than B and C, and of the two latter, C is harder than B. Precautions are taken in the apparatus to prevent injury to the parts from the sudden recoil when the hold of the coil on the bar ceases.

Preserving Cleopatra's Needle.

The London Metropolitan Board of Works recently took in hand the subject of preserving their Cleopatra's Needle, which had caused so much trouble to float to its destination. After consultation with experts it was decided to grant to one Henry Browning the job of cleaning and coating the monolith with a solution of his own invention.

The effect, says the *Times*, has exceeded the most sanguine expectations of the Board of Works. In operating upon the granite Mr. Browning first gave it a thorough cleansing, removing all the sooty and greasy matters from the surface, and indurated it with his invisible preservative solution. The effect has been to give a freshness to the granite as if only just chiseled from the rock, retaining the original color, disclosing the several veins, the white spar shining in the sun's rays like crystals, and exhibiting the polished portions as they formerly existed. More than this, the "intaglio," or the hieroglyphic engravings, come out far more pointedly than before, and the injuries the stone has received are now plainly distinguishable from the hieroglyphics. The solution soaks well into the pores of the granite, and the best authorities consider that it will have the effect of thoroughly preserving the monolith for centuries yet to come.

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.

NEUERE APPARATE FUR NATURWISSENSCHAFTLICHE SCHULE UND FORSCHUNG. 1te Lieferung gesammelt von M. Th. Edelmann. Stuttgart: Meyer & Zeller's Verlag (Fred. Vogel). 1879.

This publication, which will be complete in three volumes, of which the first has appeared, contains illustrations and descriptions of new and improved physical instruments, such as galvanometers, chronoscopes, hygrometers, inclinometers, etc. A careful and very interesting description of the experiments made with the instruments, their results and applications, tend to make it very useful to all interested in exact and precise physical measuring and experimenting instruments.

DICKENS' DICTIONARY OF LONDON.

We are favored by the editor, Mr. Charles Dickens, with a copy of his new Dictionary of London. The work is more a guide book and encyclopedia of general information, than a dictionary, and visitors to London could scarcely have a more useful book of reference. It directs the stranger what places of interest to visit and how to reach them. It warns strangers against the tricks of confidence men, and tells them how to get rid of beggars. If the beggar is English, says Mr. Dickens, take no notice of him at all. He will follow you till you meet a more likely looking person, but no further. If your tormentor be an Italian, lift your forefinger knuckle upwards to the level of your wrist as it hangs by your side, and wag it twice or thrice from side to side. Your Italian who will take no other negative accepts that instantly. The whole of the information is given in a concise and interesting form, and the book is one of the cheapest shilling's worth published. It is issued at the office of "All the Year Round," Wellington street.

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) H. C. asks: 1. What besides phosphorus will render articles luminous in the dark; that is, highly luminous? A. Canton's phosphorus, an anhydrous calcium sulphide, is sometimes used for this purpose, and the phosphorescence exhibited by it after exposure to sunlight compares very favorably with that of phosphorus. 2. Where can I get any information as to how the so-called fire kings handle heated rods, etc.? A. You may consult Pepper's "Playbook of Chemistry."

(2) J. H. asks (1) for a process for plating table cutlery, etc., with silver or a white alloy, and the necessary tools for doing the work. A. Such articles are commonly silver plated by connecting them with the zinc pole of a galvanic battery or negative electrode of a dynamo-electric machine, and suspending them for a short time in a bath composed of: water 1 gallon, potassium cyanide 12 ounces, and cyanide or chloride of silver about 1 ounce. The other pole of the battery or dynamo-electric machine is connected with a plate of pure silver, which is suspended in the bath facing the articles to be plated. Before placing in the bath the latter must be thoroughly freed from all traces of grease and other impurities. This is usually accomplished by boiling them in strong soda or potash lye, rinsing in running water, and scouring with pumice stone and potassium cyanide by means of suitable brushes, after which they are again quickly rinsed and immediately trussed in the bath without touching with the fingers. Before placing in the silver bath, however, it is customary to suspend them momentarily in a somewhat weaker ("striking") silver bath worked with a stronger current of electricity. 2. Also an explanation of the nickel plating process; will the crucibles used for one do for the other also? A. For the nickel plating process see article on p. 209, volume 38, SCIENTIFIC AMERICAN. Crucibles are not used in any of these operations.

(3) F. J. K. asks for recipe for making a black gloss (Japan ink). A. Borax, 1 part; shellac, 6 parts; boiling water, q. s.; color with soluble aniline black.

(4) H. S.—For electro-gilding baths see p. 2540, No. 160, SCIENTIFIC AMERICAN SUPPLEMENT. The following baths are used in electro-silver plating: Whitening or "striking" bath: potassium cyanide, 1 lb.; silver chloride (or cyanide), ¼ troy ounce; water (soft), 1 gallon, filter before using. Plating bath: potassium, 12 ounces; silver cyanide (or chloride), 1 troy ounce, soft water, 1 gallon; filter into a porcelain or glazed earthen vessel for use.

(5) W. N. G. asks for a glue that will fasten steel to wood firmly. A. Try one of the receipts recommended in No. 158 of SCIENTIFIC AMERICAN SUPPLEMENT.

(6) W. S. M. asks: What will cement bone and brass and be impenetrable to heat and water? A. See No. 16 in the list of cements, SCIENTIFIC AMERICAN SUPPLEMENT, No. 158.

(7) H. S. writes: Can you journalize the following item? (Suppose I was the book-keeper for the firm of Smith & Brown.) A certain note for $2,000, drawn by James Jones, is deemed to be bad. In relation to this note Mr. Smith says to his partner; "I will sell my half interest in Mr. Jones' note for $500: do you know any one who will buy it?" Mr. Brown says: "Yes, sir, I will give you that sum for your half of the note." The note was in consequence indorsed over to Mr. Brown, and the bookkeeper was instructed to make the necessary entries. Now, then, what are the entries to be made in the journal? A. The problem you submit is: The firm of Smith & Brown hold a note made by Jones, for $2,000, said note being considered worthless. Smith sells his share to Brown for $500. What is the Journal entry on the firm's books? Ans. Loss and Gain Dr. to Bills Rec. Reason 1. When a note is known to be bad it should be taken from the Bills Rec. account, as that account will not then show the value of notes on hand. Reason 2. The firm parted with this note without consideration, hence it was a loss whether B. collects on it or not.

(8) F. S. D. asks: What cement is used to fasten in the sides of bisulphide of carbon prisms? It must of course be insoluble in the fluid. A. A melted mixture of good glue and concentrated glycerine, the composition used for inking rollers in printing presses, answers very well. See also the 3d and 4th receipts in the list in SCIENTIFIC AMERICAN SUPPLEMENT, No. 158.

(9) M. F. asks (1) for a receipt to make rubber cement to mend rubber belts or boots or any soft rubber goods. A. Dissolve 1 drachm of gutta percha in 1 ounce of bisulphide of carbon, filter through coarse filtering paper, add 15 grains of pure rubber, rub the whole smooth with a palette knife, taking care to do it quickly. If too thick, thin it with bisulphide of carbon. As this fluid is very volatile it should not be used in the vicinity of a fire or light. 2. Also a durable lacquer for finely polished and burnished brass. A. Seed-lac, 3 oz.; turmeric 1 oz.; dragon's blood ½ oz.; alcohol 1 pint. Digest for three or four days in a warm place, shaking it occasionally. Decant and filter. It is of a deep gold color.

(10) G. A. B. asks: 1. Does not the zinc consumed in an electric battery remain in the fluid? A. Yes. 2. If so, what are the different combinations formed with different acids? A. The acids combine with the zinc, forming zinc sulphate, nitrate, chloride, etc., as the case may be. 3. Are none of these of utility? These are marketable if purified. 4. Is it safe to evaporate the fluid over a kitchen fire? A. Generally, no. 5. Is an iron vessel suitable for the purpose? A. No; use a porcelain enameled iron vessel. 6. Can the powder remaining after evaporation be fused in an ordinary graphite crucible, and what heat is required? A. These salts are decomposed and partially votalilized at a red heat, impure zinc oxide remaining, if carbonaceous matters are not present.

(11) J. B. R. asks for a receipt for making mead—McElree's—now sold in New York, or how to get one. A. Mead proper consists of a slightly fermented solution of honey in water. The mead sold at soda water fountains commonly consists of glucose (starch sugar) with a little cane sugar, boiled rice or starch water, and traces of various fruit juices.

(12) E. S. P. asks how to stiffen leather. A. Leather is somewhat stiffened by extracting the oily matters with bisulphide of carbon, and afterward immersing it for a short time in a hot concentrated solution of zinc chloride, pressing and drying at about 220° Fah.

(13) H. A. D. writes: You speak of connecting Bunsen's battery direct to electric lamps. Could I attach 3 or 4 electric lamps to the same battery, or would I require separate cell for each lamp, and what would be the cost of running them per hour a single lamp? How many cells would it require per lamp? A. To produce a good light requires from 40 to 50 cells to each lamp. A current is produced much more economically by means of a dynamo-electric machine than with a battery.

(14) F. H. writes: Some time ago I saw directions for making a chemical lamp. Please tell me through your columns what you know of it and whether it will work. A. The phosphorus lamp referred to is a French toy of little practical value. It consists of a wide mouthed vial containing a few fragments of perfectly dry phosphorus dissolved in a small quantity of oil. When the vial is agitated and the stopper removed so as to admit fresh air, the film of oil adhering to the sides glows with a faint phosphorescent light visible only in a darkened room. In preparing the solution the oil may be heated in the bottle over a hot water bath and the fragments of dry phosphorus cautiously added. Occasionally agitate the bottle gently to insure the mixture of its contents.

(15) C. F. K. writes, in answer to H. S. P. and E. F. F.: 1. Of the thirty-six elements whose specific heat has been redetermined with great accuracy by Regnault and Kopp, thirty-one agree closely with the law of Dulong and Petit, and there are good reasons by which the discrepancy of some of the others may be explained. See Ad. Wurtz, "Dictionnaire de Chimie," i., p. 402. Still it is not pretended that the law is absolutely demonstrated. 2. Strange as it may seem, two and one sometimes do make two instead of three. It is a matter of experimental evidence that 2 vol. H + 1 vol. O make 2 vol. H_2O vapor. The accepted explanation is given in "Molecular Chemistry, No. 2." [For a more comprehensive treatment of the questions we refer H. S. P. and E. F. F. to pp. 131-134 *et seq.* and p. 191, of Prof. Josiah P. Cook's admirable popular treatise on "Chemical Philosophy,—"The New Chemistry"; also to Professor Remsen's late work on "Theoretical Chemistry."]

(16) G. W. S asks: 1. Is there any rule for setting the spring packing in an engine cylinder? A. There is no rule, but it is best to set them out no more than necessary to have them tight. 2. The engine is 14x30 inches cylinder, and boiler 54 inches in diameter and 16 feet long, 7-16 inch iron. Is it safe to carry 90 lb. steam pressure; we cannot do our work with less? A. Yes, if of good iron and in good order. Government inspectors' rule would allow you to carry much higher pressure. 3. Is there any liquid for cleaning brass, such as brass band horns? A. Dissolve 4 oz. of bichromate of potash in 1 pint of hot water; when cold, add slowly 3 oz. of sulphuric acid; as soon as the brass is cleaned, rinse, and polish with fine whiting. If the horn is in fair condition the acid solution should be diluted.

(17) E. R. asks: 1. How long will a good permanent magnet retain its magnetism, providing the armature is removed about once or twice every second? A. This treatment will speedily destroy a magnet. 2. After a magnet is weakened, will it return to its original strength if the armature is allowed to remain in contact with it for some time? A. It will improve if the weight of the armature be augmented daily, but it will take a long time for it to become strong. 3. Is there any difference in the wearing qualities of a permanent magnet with an armature, and a Bell telephone magnet with diaphragm, on account of the different conditions under which the armatures are removed from their respective magnets? If so, what is the difference? A. The magnet of the Bell telephone has an armature permanently attached to it, and is not, therefore, liable to become weakened. 4. How long will the magnet of a Bell telephone in average daily use last? A. With proper care we cannot see why it should ever fail.

(18) A. C. D. asks for recipe for the preparation to put on lamp wicks so they will not burn out. A. Steep them in a concentrated aqueous solution of tungstate of soda, and then dry thoroughly in an oven.

(19) M. G. writes: 1. I have 2 tanks, in which gas is compressed at 250 lb. per square inch. The first cylinder contains 30 feet, size 10 inches diameter by 30 inches height. The second cylinder contains 60 feet, size 10 inches diameter by 60 inches height. At what figure will the gauge show, when first charged, and at what figure, when 15 feet are used from the first, and 15, 30, and 45 feet from the second? A. At a constant temperature the tension of a gas is proportional to the pressure. Taking your figures the normal contents of the first tank would be $\frac{\sqrt{10} \times .7854}{1728}$ or about 1¾ cubic feet. 250 lb. per square inch equals about 16·6 atmospheres. At this pressure the tank in question would therefore hold 1¾x16·6—or about 21 cubic feet. In removing one half the gas you reduce the pressure one half, and so on. 2. Can the oxyhydrogen light be made any brighter, by substituting something else for the lime, or by some other means? A. Pure anhydrous magnesia yields a somewhat better light, but, unfortunately, it is too soft for practical purposes. Within certain limits the light may be increased by increasing the tension of the gases and (slightly) the aperture of the jet. Adjust the gases so that the tip of the blue inner cone of the flame is within 1-16 of an inch of the jet, and bring the surface of the lime as close to this as possible without touching the jet. If using the gases under considerable tension the lime cylinder must be turned frequently, as the mechanical action of the impinging gas is frequently sufficient to form cavities in soft lime which deflect the flame upon the jet to the injury of the latter.

(20) O. E. asks how to cover a smooth steel cylinder, ⅝ inch diameter by 6 inches long, with brass 1-16 thick all around, and get it to adhere, so I can cut a thread through the brass without danger of it loosening from the steel. A. You may do it by soldering a well fitted brass tube to the steel cylinder.

(21) R. E. H. writes: 1. An old gentleman while watching some hounds on the chase lately, and using a telescope of about two inch object glass, on raising the glass to his eye could hear the hounds plain when previously he could not hear them at all. The same result was reached on repeating the experiment and has been demonstrated several times since. Now is this fact that with a telescope to your eye you can hear sounds from the region towards which you are looking as much plainer as you can see objects clearer, generally known, and if so, what is the cause? A. The telescope does not affect the hearing in one way or the other. The fact that the hounds were more clearly heard when the telescope was used is due to the concentration of attention in that direction and to an extra effort at that particular time. Undoubtedly imagination has something to do with it. 2. If air is compressed to one half its original bulk, and then allowed to cool, how many units of heat will escape per given quantity? A. It depends upon the weight of air compressed. 3. Could a locomotive with small drive wheels run as fast by expanding its steam as one with large drivers, provided that the extra friction of machinery and wheels were not counted? A. Yes, up to the limit of safe velocity. 4. Is a vertical tubular boiler as safe as any kind to use in small yacht to run in very rough water? A. Yes, if properly proportioned and made. 5. Would there be danger with such a boiler to run into rough water suddenly after standing at wharf in harbor, and with the same is there danger of surcharged steam? A. Yes, if improperly constructed or injudiciously managed. 6. Is the water in the boilers of ocean steamers prevented from dashing into the engines by the height of the steam outlet, or are there other means? A. Yes, and sometimes division plates are fitted to check or control the movement of the water. 7. What are the principal difficulties in using steam on common roads, and has the reward of $10,000 offered by the State of Wisconsin for the best steam wagons yet been granted? A. Want of economy and liability to accident. We believe the premium has not yet been awarded. 8. Can you get more power with less weight

by using very high pressure steam, and how high is it practically safe to carry it on the best boilers? A. Yes, carry as high steam as you please, and make your boiler of proportionate strength. 9. Can greater pressure with less weight be had from some form of pipe boiler or a stronger build of vertical tubular? A. Yes. 10. Are small boilers ever made of solid cast steel, and is it a valuable material to use for them? A. No.

(22) A. M. G. asks for a simple recipe for making the colored fire used so extensively in parlor theatricals, processions, etc.; the blue and the gold color especially are what he would like to know about. A.

	a green	b red	c yellow	d blue	e white
1 Potassium chlorate	32·7	29·7	—	54·5	—
2 Sulphur	9·8	17·2	—	—	20·
3 Charcoal	5·2	1·7	3·8	18·1	—
4 Barium nitrate	52·3	—	—	—	—
5 Strontium nitrate	—	45·7	—	—	—
6 Sodium nitrate	—	—	9·8	—	—
7 Ammo. cop. sulphate	—	—	—	27·4	—
8 Potassium nitrate	—	—	62.8	—	60·
9 Antimony sulphide	—	5·7	—	—	5·
10 Floury gunpowder	—	—	—	—	15·

It is hardly necessary to mention that great care is required in mixing these materials to avoid accident, and that each ingredient must be powdered separately. The substances must of course be free from moisture. These fires should never be used indoors, as the products of the combustion are very irritating, and, in some cases, very poisonous.

(23) "Farmer" asks (1) would not cotton seed oil be as good as linseed oil for common work, for preserving wood and preventing it from cracking? A. Probably not. It might be worth while to try comparative experiments. 2. Is there anything that can be applied to cotton seed to render them smooth and hard without injuring the germinating power of the seed? A. We know of no such substance.

(24) W. S. writes: In answer to a former query you stated that sodium was a monad metal and would combine with but one atom (of chlorine). Is it a monad only in this case? How do you explain the combination of sodium with from one to six atoms of carbonic acid? A. Hydrogen and sodium carbonate, hydrosodic carbonate, acid sodium carbonate, $NaHCO_3$ or $Na_2CO_3.H_2CO_3$, commonly called bicarbonate of soda, is prepared by passing a current of washed carbonic acid through solution of sodium carbonate. If the solution is concentrated the bicarbonate is deposited as a powder. It is, however, more advantageous to cause the carbonic acid to act upon a mixture of 1 part crystallized and 4 parts effloresced sodium carbonate. Sodium carbonate precipitates solution of magnesium sulphate, while the bicarbonate does not. From this reaction the point at which the conversion is completed may be readily ascertained. The so-called sesquicarbonate of soda (dihydro-tetrasodic carbonate—$Na_4H_2(CO_3)_3+2OH_2O$), remaining with the 9 equivalents of water displaced when carbonic acid acts upon the crystallized neutral salt, is regarded as a compound of the latter with the acid salt $[Na_2CO_3.2(NaHCO_3)]$. There is nothing in these reactions to indicate that sodium is other than a univalent element.

(25) W. C. R. asks: 1. What will take mildew out of canvas sails? A. Solution of calcium hypochlorite (bleaching powder) in cold water or vinegar. Use plenty of cold water afterwards. 2. Is there any way to prevent sails mildewing? A. Treatment with strong aqueous solution of alum or lead acetate (sugar of lead) answers very well.

(26) H. T. H. asks how to make printer's ink rollers, as it is too expensive to send to the north for them. A. They are usually made from glue and glycerine, glue and molasses, or a mixture of these. Take an equal quantity of good glue and concentrated glycerine; soften the former by soaking in cold water, then melt it over the water bath, gradually adding the glycerine. Continue the heat until the excess of water has been driven off, meanwhile constantly stirring. Cast in brass or bronze moulds well oiled.

(27) W. E. S. writes: I made an electric telephone, as described in SUPPLEMENT, No. 142, like Figs. 1, 2 and 3, excepting I wound my magnet with more than ¾ oz. No. 36 wire. Would that make any difference in its working; mine fails to give the slightest sound? What is the matter with it? A. You do not give sufficient particulars to enable us to tell what prevents your instrument from working. We, however, suggest the following: Your connections may be defective. You may have clamped the two magnets between pieces of iron or steel. These pieces should be brass or wood, and the magnet poles which are placed against the soft iron helix core should be of the same name.

(28) W. F. M. writes: I have a couple of 200 bbl. pine tubs (new), and I wish to fill them with vinegar for storage. How can I fix them so that the vinegar will not taste of the pine or other bad taste? I wish to leave the vinegar in the tubs for five or six months. A. Melted resin (pale) is generally used, we believe.

(29) J. A. asks if a tank lined with the usual thickness of sheet lead is liable to corrode and leak. A. Lead is perceptibly acted upon by rain water, but such a tank, if properly constructed, will last many years without danger of leaking. The water stored therein should not be used for drinking or culinary purposes.

(30) E. V. C. asks if a candle burning in a shaft in which there is occasionally bad air, on account of want of ventilation and powder smoke, increases or diminishes the bad air? The shaft is in a quartz lode. A. If the shaft is the only air passage to and from the works the candle so placed will not improve the ventilation.

(31) J. E. W. writes: I have a slated roof that leaks during heavy storms in an angle formed by an addition. Please give me a receipt for stopping the leak so that it will not be affected by the heat or cold. A. You may try red lead, followed by a good coating of genuine asphaltum varnish.

(32) F. T. W. writes: 1. I see in SCIENTIFIC AMERICAN, volume 37, page 72, that nitrate of ammonia is used for cooling water. How much of the ammonia will it take to cool three gallons of water? A 3 or 4 lb. of the salt will answer if properly used. The cooling is occasioned by the rapid solution of the salt, and ceases when complete solution is effected. 2. Which is the best to keep it in, a glass bottle or a tin can made for the purpose? A. The salt should be kept in a well stoppered glass bottle; tin will not answer.

(33) A. L. B. asks how to make the enamel lining to cast iron kettles, commonly called porcelain kettles. A. Grind together 100 parts of powdered calcined flints (or white quartz sand, free from iron), 50 parts of calcined borax (borax glass), and 20 parts of kaolin (white potter's clay), pass the mixture through an 80 mesh sieve, and mix it with water to form a thin paste. Line the clean vessel with this and let it dry slowly. Then fuse together 125 parts of white glass, 25 of borax, and 20 of soda; powder when cold, and make into a thin paste with 4 parts of soda and a sufficient quantity of hot water. Cover the first coating with this, and, after thoroughly drying, heat in a muffle until the glazing has properly fused.

(34) H. W., Jr., asks what is the meaning of the word ebonite? A. Ebonite is a variety of hard rubber—made by exposing gum rubber (caoutchouc) mixed with about half its weight of sulphur to a temperature of about 300° Fah., under pressure. See pp. 48 and 105, volume 39, SCIENTIFIC AMERICAN.

(35) G. K. asks if there is any book published on metals which treats of their fusibility and other properties, also of alloys. A. Consult Guthrie's "Metallic Alloys," and Byrne's "Practical Metal Worker's Assistant."

(36) L. C. R. writes: I have often been puzzled to know the origin of the names used to designate the different sizes of nails; 8 penny, 10 penny, etc., and have never heard any answer that seemed satisfactory. The statement that the numbers are based on the number of pounds in weight of a thousand nails of each size, would, if proved to be correct in the matter of weight, still not satisfy the penny. A. We have no doubt the term "penny" means "pound" in this connection, and that nails were originally made so that 4 penny nails weighed 4 lb. per thousand, 10 penny nails weighed 10 lb. per thousand, and so on.

(37) W. K. B. & S. write: We have a Leclanche battery which has been in use for 4 months, with two electric call bells. It has become very weak. What shall we put in it to make the bells strong? A. Put a handful of salammoniac crystals in each cell and fill up with water. If this does not help them, remove the carbon and the black oxide of manganese from the porous cells, clean the carbons and the cells, and refill the latter with fresh black oxide of manganese.

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

A. R. C. & Co.—The fossiliferous rock contains about 14 per cent of iron and a notable quantity of lime phosphate.—X. Y. Z.—1 and 3. Fossiliferous limestone. The other samples are chiefly dolerite with a small quantity of hematite.—S. C.—It is a sample of fine bituminous coal. The property will doubtless prove valuable.—W. D.—Partially decomposed iron pyrites associated with arsenopyrite.—S. B. T.—Lead sulphide (galena) a valuable ore of lead.—W. K. I. B.—It is a trap rock, containing nothing of value.—H. S.—It is the petroleum jelly called vaseline—a product of petroleum.

COMMUNICATIONS RECEIVED.

On Economical Brewing. By J. O. B.
On Foot Lathes for Watch Work. By W. F. A. W.
On Theory of the Universe. By H. C.

[OFFICIAL.]

INDEX OF INVENTIONS

FOR WHICH

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

June 3, 1879,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

Air compressor, C. Moore ... 216,211
Alarm lock, T. N. Roberts ... 216,219
Animal power, J. F. McCreary ... 216,205
Ankle supporter, J. G. Pugsley ... 216,206
Axle bearing, car, H. W. Farley ... 216,165
Bale tie, N. A. Haven ... 216,088
Baling press, P. K. Dederick (r) ... 8,737
Barber's chair, L. Marx ... 216,208
Bed bottom, spring, D. B. Peck ... 216,057
Bed, folding cot, H. W. Ladd *et al* ... 216,194
Bed spring, W. A. Bronson ... 216,142
Belt fastener, O. H. Jones ... 216,092
Blanket strap, H. B. Richmond ... 216,218
Blind slat planing machine, C. P. S. Wardwell ... 216,070
Bone mill, G. Palmer ... 216,101
Boot and shoe, I. N. Mudgett ... 216,100
Boot and shoe heel stiffener, S. Prior ... 216,105
Boot and shoe heel stiffeners, mould for forming, W. C. Wise ... 216,122
Boring and reaming tool, R. T. Crane ... 216,093
Boring bit, J. O. Martin ... 216,202
Bridle safety bit, M. P. Shields ... 216,220
Broom protector, adjustable, A. R. Norton ... 216,054
Brush, shoe, F. Znenkeler ... 216,123
Bubble blower, D. Greenwalt ... 216,176
Buckle, G. D. Smith ... 216,114
Can supporting case, Perkins & Brown (r) ... 8,738
Car brake shoe, Conner & Denio ... 216,152
Car spring, C. French ... 216,172
Carburetor, gas, P. Keller ... 216,191
Card holder, M. F. Potter ... 216,058
Casting steel ingots, W. A. Sweet ... 216,117
Cellular press, F. G. Wiselogel ... 216,075
Chain slide, neck, A. Oppenheimer ... 216,101
Chair stock finisher, L. B. Batcheller ... 216,015
Chandelier, extension, G. Bohner ... 216,018
Churn, L. Sibert ... 216,111
Churn dasher, J. E. & W. H. Gibbs ... 216,033
Cigar and cigarette holder, R. C. Du Bois ... 216,160
Cigar maker's table, C. Backshaum ... 216,140
Cigarette machine, C. G. & W. H. Emery ... 216,164
Cock for steam generators, try, J. Regester (r) ... 8,739
Coin holder, A. L. Thurston ... 216,068
Clasp, B. Greig ... 216,177
Clock movements, lock work for, G. B. Owen ... 216,215
Cloth cutter, A. Warth ... 216,245
Collar, horse, A. B. Harris ... 216,087
Collar, steel horse, E. Fisher ... 216,168
Colors, composition for applying, A. E. Mery ... 216,207
Colter, A. Aldrich ... 216,128
Combing and carding machines, mechanism for forming laps for, S. R. Parkhurst ... 216,103
Corset, G. H. Clarke ... 216,150
Cotton tie fastener, J. D. Moore ... 216,096
Cuff holder, C. F. Doring ... 216,158
Current motor, W. W. Cleaveland ... 216,151
Cylinders, cutter heads, etc., device for balancing, C. Seymour ... 216,228
Dental plates, process and apparatus for the manufacture of, L. N., G. N., & L. N. Winderling ... 216,250
Dental plugger, electric, E. L. Paine ... 216,055
Ditching machine, C. D. Edwards ... 216,162
Door open, device for holding L. B. Leech ... 216,195
Dredging scoop nozzle for mining, S. W. Shaw ... 216,061
Drinking cup, collapsible, C. Sedgwick ... 216,227
Egg beater, G. Mooney ... 216,053
Elevator, C. W. Baldwin ... 216,013
Elevator safety device, R. M. Curtiss ... 216,024
Farm gate, H. W. Goodwin ... 216,035
Feed water to boilers, device for supplying, S. M. Fulton ... 216,173
Fence, iron, K. D. Dodge ... 216,028
Fence post, J. Hayne ... 216,037
Fence post, K. McKinnon ... 216,052
Firearm, breech-loading, H. Bader ... 216,012
Firearm, breech-loading, F. W. Freund ... 216,034
Firearm, magazine, A. Burgess ... 216,080
Fishing apparatus, C. N. A. Voss ... 216,242
Flower, artificial, C. Schwenkel ... 216,223
Food, cattle, N. S. Lukey ... 216,199
Fork and fork maker, W. Chisholm ... 216,021
Fruit or preserve jar, A. Gummer ... 216,036
Fuse, blasting, G. Bloem ... 216,137
Gas for metallurgical, etc., apparatus for producing, Du Motay & Jerzmanowski ... 216,118
Gas generator, Du Motay & Jerzmanowski ... 216,119
Gas regulator, C. Hoffmann ... 216,186
Glass mould, D. Barker ... 216,134
Governor, steam engine, W. B. Carithers (r) ... 8,735
Grain binder, C. L. Travis ... 216,241
Grain scourer and cleaner, M. Toulmin ... 216,240
Grain separator, J. W. Morrison ... 216,212
Grinding tool, F. Mason ... 216,093
Grub puller, J. C. Hodges ... 216,090
Hame fastener, E. Covert ... 216,155
Harness loop, W. E. Dippert ... 216,027
Harness strap cutter, H. L. Gordon ... 216,174
Harrow teeth, rest and holder for pointing, C. P. Buckingham ... 216,019
Harvester elevator, C. Ainsworth ... 216,126
Hatchway door, W. H. Cooke ... 216,154
Hat and cap former, straw, J. B. Mowry ... 216,213
Hay elevator, J. C. Armstrong ... 216,130
Hay fork, horse, H. W. Seavey ... 216,225
Hay press, F. B. Boalt (r) ... 8,733
Hay rake, horse, S. T. Ferguson ... 216,166
Hay rake, horse, D. P. Sharp ... 216,110
Hay rake, revolving, J. H. McCormack ... 216,094
Hoe, N. W. Mills ... 216,210
Hoe maker, A. Schwehr ... 216,224
Hoop shaving machine, Philpott & Horton ... 216,216
Horse power, direct acting, Herbert & Henry ... 216,089
Horse rake, G. M. Titus ... 216,239
Horses from stalls, releasing, J. T. Condon ... 216,022
Horseshoe, J. Whiteford ... 216,248
Horseshoe calk attachment, W. Dickinson ... 216,026
Hydrocarbons, manufacture of porous blocks for effecting combustion of, G. H. Lilley ... 216,196
Ice makers, cut-off for, S. B. Hunt ... 216,040
Insects by fumigation, device for destroying, R. B. Rathbun ... 216,040
Inspirator, W. E. Park (r) ... 8,734
Insulator, telegraph, J. H. Bloomfield ... 216,138
Kiln for calcining limestone, etc., F. F. Tatro ... 216,066
Knitting machine, W. Aiken ... 216,125
Knob attachment, door, D. & T. Morris ... 216,098
Lamp, Blaisdell & Young (r) ... 8,732
Lamp extension device, D. Whiteford ... 216,072
Lubricator, N. Seibert (r) ... 8,740
Mail box, J. Sherriff ... 216,229
Mask, sanitary, P. H. Foster ... 216,171
Meat carrier, Watkins & Bryant ... 216,246
Medicament capsuler, S. Limousin ... 216,197
Medicine package, J. H. Guild ... 216,132
Middlings purifier, H. White ... 216,121
Military accouterments, J. E. Bloom ... 216,017
Millstones, shell for incasing, D. W. Marmon ... 216,048
Motion, converting, E. J. Frost ... 216,032
Mower, lawn, E. G. Passmore ... 216,056
Net for horses, fly, G. R. Ayres ... 216,133
Numbering machine, J. Macdonough ... 216,045
Nut lock, C. Schifferly ... 216,222
Ore roasting furnace, D. W. Brunton ... 216,148
Oven door and roaster, H. C. Atkinson ... 216,132
Oversleeve, A. P. Smith ... 216,115
Packing, piston rod, S. Armstrong ... 216,131
Packing, piston rod, J. Hewitt ... 216,038
Paddlewheel, feathering, W. T. Merritt ... 216,208
Padlock, T. Slaight ... 216,062
Paper box corner piece, D. Steinberg ... 216,237
Paper collar, S. F. Hilton ... 216,039
Paper cutting machine, G. R. Clarke (r) ... 8,736
Paper for floors, oil printed, T. S. Scott ... 216,109
Paper, making flexible, T. S. Scott ... 216,108
Paper pocket, H. A. Fisher ... 216,169
Paper pulp screen, J. S. Warren ... 216,243
Pen, pulsating stencil, Gunning & Weiland ... 216,086
Pencil and watch key, L. W. Fairchild ... 216,031
Piano, K. V. Barnekov ... 216,135
Pill machine, J. M. Richards ... 216,107
Planter, check row corn, D. Unthank ... 216,120
Planter, corn, A. Aitken ... 216,127
Planter, corn, J. Kelly ... 216,041
Planter, corn, Seamans & Glezen ... 216,226
Planter, corn, G. Simonson ... 216,113
Planter, seed, G. W. Edwards ... 216,163
Plow, J. M. Matthews ... 216,050
Plow and cultivator coupling, W. P. Brown ... 216,145
Plow attachment, W. P. Brown ... 216,146
Plow beam bender, W. J. Ball ... 216,077
Printers' rollers, receptacle for, J. Glastaeter ... 216,083
Printing machine, lithographic, J. Krayer ... 216,193
Propeller, hydraulic, Brewer & Ward ... 216,140
Propeller, screw, Von Binzer & Bentzen ... 216,136
Propeller, screw, J. B. Ward ... 216,244
Propelling device for vessels, D. Gough ... 216,175
Pulley, W. Brown ... 216,079
Pulley, belt, P. Medart ... 216,095
Pump, air, H. Weindel ... 216,071
Razor strop, J. H. Davis ... 216,157
Reel and drawer box, G. Simon ... 216,233
Refrigerator, W. H. & A. McCormick ... 216,204
Refrigerator building, W. Leland ... 216,043
Rocking chair, J. S. Macord ... 216,[illegible]
Rolling mill, W. H. & J. Whyte ... [illegible]
Rope coils, rack for holding, W. Schanweber ... 216,224
Rope fastening, Brooks & Braswell ... 216,141
Rotary engine, W. N. Fort ... 216,170
Rubber compound, hard, Connell & Fagan ... 216,[illegible]
Rubber, machine for grinding and doughing India, J. Heald ... 216,[illegible]
Saddle, harness, J. R. Young ... 216,254
Sample box, C. E. Co brane ... 216,081
Saw handle, J. Holden ... 216,091
Saw mills, lumber gauge for, W. M. Dunn ... 216,161
Saw setting machine, W. T. Smith ... 216,063
Scale and coin tester, G. Hoak ... 216,184
Scraper, corn and cotton, J. L. Pugh ... 216,060
Scraper, farm, street, and road, J. Williams ... 216,074
Scraper, sulky, W. C. Marr ... 216,201
Seed drills, drill point for, J. A. Jones ... 216,189
Seeding machine, B. Delong ... 216,025
Sewing machine, H. Bland ... 216,016
Sewing machine needle, J. P. Bridge ... 216,141
Sewing machine tucker, C. F. Knoch ... 216,192
Sewing machine, wax thread, E. E. Bean ... 216,078
Shaft supporter, vehicle, J. W. Osburn ... 216,214
Sheep protector, J. R. Speer ... 216,235
Sheet metal can, J. S. Field ... 216,167
Shirt protector, G. E. Wickens ... 216,249
Shoe, L. Rose ... 216,230
Shoe, laced, O. Durocher ... 216,029
Shoe shank stiffener cutter, O. Littlefield ... 216,044
Sink trap, T. H. Sutton ... 216,238
Sink trap and valve, A. S. Hodges ... 216,185
Skake, F. E. Dowler ... 216,159
Skate, water, W. C. Soule ... 216,234
Sleigh knee, P. H. Cummins ... 216,156
Spinning mule momentum brake, J. D. Stanwood ... 216,236
Spoke sawer and tenoner, S. G. Mason ... 216,049
Stall on shipboard, horse, J. Arless ... 216,129
Stamp canceler, E. W. Brenner ... 216,139
Stamp, hand, Tenney & Reese ... 216,067
Stamping mill, A. B. Lipsey ... 216,198
Staples, machine for inserting and clinching metallic, W. J. Brown, Jr. ... 216,144
Steam boiler and furnace, C. W. Reed (r) ... 8,730
Steam boiler damper regulator, A. C. Harrison (r) ... 8,731
Stone, restoring and preserving C. O. Lundberg ... 216,045
Stove, heating, J. E. Gridley ... 216,178
Stove, open front, O. C. Mehurin ... 216,200
Stove pipe thimble, H. B. Morrison ... 216,097
Stump and stone extractor, A. E. Cummings ... 216,082
Stump extractor, R. Mortensen ... 216,099
Suspension rods, machine for forming eyes on, Streit & Burns ... 216,065
Telephone, mechanical, J. W. Maxwell ... 216,051
Thermostat, F. W. Mallett ... 216,047
Thill coupling, G. H. Weed ... 216,247
Thrashers and separators, straw elevator for, A. W. Meyer ... 216,209
Tongs, pipe, H. Banister ... 216,014
Toy return ball, T. Adams ... 216,124
Trace or tug, D. R. Porter ... 216,217
Type writing machine, Sholes & Miller ... 216,232
Valve, T. Pitt ... 216,104
Valve, oscillating, Elliott & McCool ... 216,030
Vehicle brake, J. C. Zweidinger ... 216,076
Vehicle spring, W. W. Grier ... 216,179, 216,180
Vehicle spring, W. A. Sweet ... 216,116
Velocipede, B. A. Joule ... 216,190
Velocipede, J. Shire ... 216,231
Ventilation, R. B. Davy ... 216,283
Wagon seat support, W. P. Brown ... 216,147
Wash board, R. Grove ... 216,181
Washing machine, R. Campbell ... 216,020
Water conductor, Irwin & Reber ... 216,188
Weather strip for doors, A. E. Gilman ... 216,084
Wells, clamp for polishing rods of oil, C. Sickels ... 216,112
Wells, etc., driving hollow metal piles for tube, LeGrand & Sutcliff ... 216,042
Wells, regulating the flow of oil, S. S. Spencer ... 216,064
Whiffletree, W. V. Wallace ... 216,069
Window shade hanging, J. J. Hunkeler ... 216,187

TRADE MARKS.

Candles, M. Costello ... 7,381
Cane mills, Deere, Mansur & Co ... 7,384
Certain medicinal preparations, S. Simes ... 7,391
Cigars, J. E. Winterfeldt ... 7,392
Cigars, G. Fuchs ... 7,386
Cigars, cigarettes, and smoking tobacco, Straiton & Storm ... 7,379
Fertilizing compositions or compounds, R. W. L. Rasin & Co ... 7,385
Flour, Thomas & Benham ... 7,380
Hair restorer, J. Lloyd ... 7,388
Illuminating oils, G. Ryneal, Jr ... 7,391
Leaf tobacco, Kirkpatrick & Co ... 7,376
Liniment, H. Lloyd ... 7,377
Medicinal preparation for the cure of whooping cough, F. Stadtmuller ... 7,382
Root beer, Bean & Brother ... 7,383
Shewing tobacco, C. B. Messinger ... 7,389
Silver plated ware, Rogers & Brother ... 7,390
Toilet preparation, C. W. Holmes ... 7,387
Waterproof garments, H. M. Sawyer ... 7,378

DESIGNS.

Bottles, J. Hoare ... 11,217
Carpet, T. J. Stearns ... 11,222
Door knobs, R. Christesen ... 11,226, 11,227, 11,229
Font of printing types, W. W. Jackson ... 11,223
Knitted fabric, G. Upton ... 11,225, 11,224
Lock fronts, R. Christesen ... 11,228
Metal drilling machine, S. W. Putnam ... 11,221
Oil cloth, C. T. & V. E. Meyer ... 11,218 to 1,220
Pincushion, E. S. Heath ... 11,219
Stall guards, Ward & Pettit ... 11,225
Umbrella handle, S. J. Cawley ... 11,216

English Patents Issued to Americans.

From June 6 to June 10, inclusive.

Amalgamating ores, C. E. Ball, Philadelphia, Pa.
Cigarette machine, C. G. Emery *et al.*, Brooklyn, N. Y.
Corset, L. M. Chipley *et al.*, St. Louis, Mo.
Copying apparatus, P. G. Rosefield, New York city.
Draught regulator, D. C. Kellem, Detroit, Mich.
Explosive compound, C. Felhoen, New York city.
Fare register, W. F. Ebbs, Buffalo, N. Y.
Gas engines, A. K. Rider, Walden, N. Y.
Lamp burner, Manhattan Burner Co., New York city.
Link coupling, A. A. Schenck, Hoosick Falls, N. Y.
Pad for therapeutic purposes, R. M. Kennedy, Pittsburgh, Pa.
Propelling vessels, J. L. Nevers, Pass Christian, Miss.
Sewing machine, T. W. Morrison *et al.*, Newark, N. J.
Sewing machine, J. Hesse, San Francisco, Cal.
Show case for needles, O. H. Blood *et al.*, Brooklyn, N. Y.
Spinning machinery, S. Metcalfe, Windsor, Conn.
Steam boilers, E. M. Hugentobler *et al.*, Philadelphia, Pa.
Ventilator, J. R. Buffham, Brooklyn, N. Y.

Advertisements.

Inside Page, each insertion - - - 75 cents a line.
Back Page, each insertion - - - - $1.00 a line.
(About eight words to a line.)

Engravings may head advertisements at the same rate per line, by measurement, as the letter press. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

CARNEGIE BROS & CO
UNION IRON MILLS
PITTSBURGH PA.
WROUGHT IRON BEAMS
CHANNELS TEES & ANGLES

The attention of Architects, Engineers, and Builders is called to the great decline in prices of wrought
STRUCTURAL IRON.
It is believed that, were owners fully aware of the small difference in cost which now exists between iron and wood, the former, in many cases, would be adopted, thereby saving *insurance* and avoiding all risk of *interruption to business* in consequence of fire. Book of detailed information furnished on application.

COMPRESSED AIR MOTORS. BY GEN. H. Haupt, C.E. Being a Report to the Pneumatic Tramway Engine Co., of New York, concerning the use of Compressed Air as a Motor for propelling Street Railway Cars. Exhibiting the feasibility of the system and the Practical Success obtained as evinced by trials of the Pneumatic Cars and Compressors on the Second Avenue Railway, New York City. With a general description of the Air Compressors, the percentages of Power Realized out of the Power Consumed in pressing the air; the extent of the air compression and how used in connection with heat in the car; the cost per mile; the distance traveled by the Pneumatic Motor; increase of power by using the cylinders as air pumps; heat and cold by compression and expansion; what grades the Pneumatic Motor can overcome and what load it can carry; theoretical test of compressors; capacity of the Second Avenue compressors; effects of using a compression of fifty atmospheres; advantages and objections to use of pneumatic motors; moral and sanitary influences; estimate of the cost of power by the use of the pneumatic system as compared with horses; cost of operating the pneumatic motors on the Second Avenue railway; tables showing the quantities of air consumed on each trip of the car, the reductions of pressure, etc., with many other interesting and valuable particulars, theoretical and practical. Contained in SCIENTIFIC AMERICAN SUPPLEMENT Nos. 176, 177, and 182. Price 10 cents. To be had at this office and of newsdealers in all parts of the country.

SHEPARD'S CELEBRATED
$50 Screw Cutting Foot Lathe.
Foot and Power Lathes, Drill Presses, Scrolls, Circular and Band Saws, Saw Attachments, Chucks, Mandrels, Twist Drills, Dogs, Callipers, etc. Send for catalogue of outfits for amateurs or artisans.
H. L. SHEPARD & CO.,
331, 333, 335, & 337 West Front Street,
Cincinnati, Ohio.

MANUFACTURERS AND PATENTEES DESIROUS of establishing agency in New York, address COMMISSION AGENT, 37 Park Row, New York, Room 17. Highest references given. Terms moderate.

$175 WILL MAKE YOU A PRACTICAL Watch Maker, enabling you to make **$25 per week.** Those having cash and mean business need only address J. L. Woodcock, Manufacturer of Watches, Easton, Md.

Wheeler's Patent Wood Filler

fills the pores of wood perfectly, so that a smooth finish is obtained with one coat of varnish. Send for circular. Mention this paper.
BRIDGEPORT WOOD FINISHING CO.,
40 Bleecker Street, New York.

HOW TO MAKE A PHONOGRAPH. Full Instructions, with Eight Working Drawings, Half Size. Construction easy and inexpensive. These drawings are from an actual working Phonograph; they show the sizes, forms, and arrangement of all the parts. The explanations are so plain and practical as to enable any intelligent person to construct and put a Phonograph in successful operation in a very short time. Contained in SCIENTIFIC AMERICAN SUPPLEMENT No. 133. Price 10 cents. To be had at this office and of all newsdealers.

FAMOUS FOOT POWER Back Geared Screw Lathes. Improved. Small Lathes, Small Hand and Power Planers for metal. Scroll and Circular Saws. Best make. Low prices. Illustrated catalogues of above. Jobs executed for all parts of the country as usual.
N. H. BALDWIN, Laconia, N. H.

FOR SALE.—A 40 H. P. Engine, now running, very low; and two Spoke Machines. Inquire of
JAMES F. BOND, 791 Broad St., Newark, N. J.

FOR SALE. Tin, Lamp, Glass, and Oil Store; also, Factory for tin ware and sheet iron work. Established thirteen years. Inquire WM. S. SULGER, No. 109 Hanover St., Trenton, New Jersey. Reason, Hemorrhage of Bowels.

"UNIQUE" FEATHER DUSTER. INvaluable to ladies, gentlemen, and every traveler. Portable as cigar or pencil. Sent on receipt of ten cents. Agents wanted everywhere. BATES & CO.,
89 Chambers St., New York.

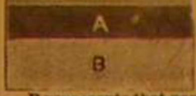
Baker Rotary Pressure Blower.

(FORCED BLAST.)
Warranted superior to any other.
WILBRAHAM BROS.
2318 Frankford Ave.
PHILADELPHIA

ON CHRONIC MALARIAL POISONING. —By Alfred L. Loomis, M.D. A Highly instructive Clinical Lecture, delivered at the University Medical College, N. Y. According to Professor Loomis the effects of malarial poisoning are manifested in a surprising variety of forms and symptoms; so numerous and various, in fact, that they cannot be tabulated. They embrace enlargement of the spleen, neuralgias of different forms, that may or may not be periodical; dyspeptic troubles which cannot be relieved by dyspeptic remedies; headaches that are often treated as cerebral diseases; confusions of mind; staggering gaits; loss of power in portions of the body; impairment of mental faculties; inability to do work of any kind; not sick enough to go to bed, but too ill and habitually too tired to perform anything that requires the least exertion; shortness of breath; rapid, weak, irregular pulse; sleepless nights, etc. The infection appears to be far more widely spread than is commonly supposed; and all who have ailments that fall within the category here mentioned will do well to read the excellent lecture. SUPPLEMENT 102. Price 10 cents.

JENNINGS' WATER CLOSETS
PRICES REDUCED — SEND FOR CIRCULAR
94 BEEKMAN STREET NEW YORK

FOR MACHINISTS' AND BOILER MAKERS' HEAVY Steel Clamps, send for circular to C. W. LE COUNT, South Norwalk, Ct.



RUBBER BACK SQUARE PACKING.

BEST IN THE WORLD.
For Packing the Piston Rods and Valve Stems of Steam Engines and Pumps.

B represents that part of the packing which, when in use, is in contact with the Piston Rod.
A the elastic back, which keeps the part B against the rod with sufficient pressure to be steam-tight, and yet creates but little friction.
This Packing is made in lengths of about 20 feet, and of all sizes from ¼ to 2 inches square.

JOHN H. CHEEVER, Treas. NEW YORK BELTING & PACKING CO., 37 & 38 Park Row, New York.

Pond's Tools,

Engine Lathes, Planers, Drills, &c.
DAVID W. POND, Worcester, Mass.

ESTABLISHED 1840.
PATENT SPARK-ARRESTER.
8-H. P. Mounted, $650.
10 " " 750.
12 " " 1000.
Send for our Circulars.
2-H. P. Eureka, $150.
4 " " 250.
6 " " 350.
B. W. Payne & Sons, Corning, N. Y.
State where you saw this.

Portable Grain Mills,

For Mill and Farm. Built on the durable and scientific principles. Warranted fully equal to any in the market. Mills for grinding all substances. We have made mill building a specialty for 13 years.
WALKER BROS. & CO.,
Engineers, Founders & Machinists,
23d and Wood St., Phila., Pa.

LIGHT DRAUGHT, FAST, STERN Wheel, Steam Yachts. These yachts are 34 feet long, 8 feet 2 inches beam; draught, 16 inches; speed, 7 miles an hour. Designed under direction of Col. F. W. Farquhar, U. S. A., by M. Meigs, U. S. Civil Engineer, U. S. Works, Rock Island, Ill. With working drawings, dimensions, and particulars of vessel, engine, boiler, and wheel, furnished by the author. The serviceable character of these boats, their simplicity of construction, roominess, and light draught render them very desirable, especially for shallow waters. Contained in SCIENTIFIC AMERICAN SUPPLEMENT No. 179. Price 10 cents. To be had at this office and of all newsdealers.

Bradley's Cushioned Helve Hammer.

Awarded first premium, Silver Medal at American Institute Fair, 1873, Cincinnati Industrial Exposition, 1874, and the Diploma of Honor and Grand Medal of Merit at the Centennial Exhibition in 1876, being the highest award given any goods of their class in America or Europe.
IT HAS MORE GOOD POINTS,
LESS COMPLICATION,
MORE ADAPTABILITY,
LARGER CAPACITY,
DOES MORE AND BETTER WORK,
TAKES LESS POWER,
COSTS LESS FOR REPAIRS,
than any other Hammer in the World. Guaranteed as Represented.
(Established 1832.)
BRADLEY & COMPANY, Syracuse, N. Y.

PAINTING. The Combined Striping Tool and Alphabet Scale can be used for striping walls, ceilings, panels, etc., by any one. The Scale shows at a glance the exact proportions and space of the different alphabets. Price $1. Patent Veneers for grainers or learners, 75 cts. a set. JAS. E. HAMMOND, Manuf., New Shoreham, R. I. **Good Agents desired.**

BUSINESS OPPORTUNITY.

$15,000 will buy an established and paying manufacturing business. Address "Administrator," Newark, N. J.

RELIABLE
DYKES' BEARD ELIXIR

LEHIGH UNIVERSITY.—Tuition Free. CIVIL, MECHANICAL, and MINING ENGINEERING; CHEMISTRY and METALLURGY; FULL CLASSICAL INSTRUCTION; FRENCH and GERMAN; ENGLISH LITERATURE; INTERNATIONAL and CONSTITUTIONAL LAW; PSYCHOLOGY and CHRISTIAN EVIDENCES. For Registers address **The Rev. John M. Leavitt, D.D., President,** BETHLEHEM, PENNA.

TOOL DEPOT — SMALL TOOLS, LATHES &c FOR MACHINISTS, CARPENTERS, AMATEURS & EVERY BRANCH OF MECHANICAL TRADE. SEND FOR CATALOGUE. TALLMAN & McFADDEN, PHILADELPHIA.

STEAM ENGINES AND BOILERS,

Wood and Iron Working Machinery.
(Send for circulars.)
GEO. M. CLAPP, Manager. BELCHER & BAGNALL, Warerooms: 40 Cortland Street, N. Y.

PATENTED ARTICLES, MACHINES, etc., manufactured in France according to the Laws by the Société Anonyme pour l'Exploitation de Brevets, 11 Rue de Flandre, Paris, France. References: Mackay Sewing Machine Association, Boston, Mass.

SCIENTIFIC AMERICAN SUPPLEMENT. Any desired back number of the SCIENTIFIC AMERICAN SUPPLEMENT can be had at this office for 10 cents. May also be had or ordered through booksellers and newsdealers everywhere. MUNN & CO., Publishers,
37 Park Row, New York.

FOR AUTOMATIC CUT-OFF, FIXED CUT-OFF & SLIDE VALVE STEAM ENGINES, ROCHESTER N. Y. ALSO BOILERS ADDRESS WOODBURY BOOTH & PRYOR.

THE

Scientific American, Export Edition.

PUBLISHED MONTHLY.

The Scientific American, Export Edition, is a large and **splendid periodical,** issued once a month, forming a complete and interesting monthly record of all Progress in Science and the Useful Arts throughout the World. Each number contains about **one hundred large quarto pages,** profusely illustrated, embracing:

(1.) Most of the plates and pages of the four preceding issues of THE SCIENTIFIC AMERICAN, with its **splendid engravings and valuable information.** Every number has from seventy-five to one hundred new engravings, showing the most recent improvements and advances in Science and the Industrial Arts.

(2.) Prices Current, Commercial, Trade, and Manufacturing Announcements of Leading Houses. In connection with these Announcements many of the Principal Articles of American Manufacture are exhibited to the eye of the reader by means of **splendid engravings;** the whole forming an elegantly printed Standard Catalogue, or Permanent Directory, of the Latest and Best American-made Goods, always under the eye of the foreign buyer, constantly influencing his preferences and purchases.

The Scientific American, Export Edition, has a large guaranteed circulation in all the principal Cities and Commercial Centers of the World. It is regularly received and filed for public examination by nearly all U. S. Consuls. Go into almost any American Consulate in any quarter of the globe, and the objects of greatest interest there to be found are the numbers of THE SCIENTIFIC AMERICAN. Foreign Merchants, Buyers of Goods, and others are always referred by the Consular Officials to the pages of this Journal, as containing the most recent announcements of the best reliable American Goods and Manufactures. THE SCIENTIFIC AMERICAN is also on file in the Principal Cafes, Club Rooms, and Exchanges. Among the regular subscribers for THE SCIENTIFIC AMERICAN, Export Edition, are leading Commercial Houses in foreign cities, Engineers, Directors of Works, Government Officials, and other prominent influential persons. Regular files of this paper are also carried on all the principal lines of STEAMSHIPS, foreign and coastwise, leaving the port of New York.

No export publication sent from the United States reaches so many readers as THE SCIENTIFIC AMERICAN, Export Edition. It is by far the most splendid, satisfactory, and superior Export Journal ever brought before the public. Its pages are so arranged as to permit the publication, at very low prices, of **large and handsomely displayed advertisements of American Goods and Manufactures, with Engravings, which are always attractive to foreign purchasers.**

THE SCIENTIFIC AMERICAN, Export Edition, already enjoys the advertising patronage of many of the Great Manufacturing Establishments of this Country, who find it to be an UNRIVALED MEDIUM FOR SECURING NEW ORDERS AND EXTENDING TRADE.

If you wish to increase your business, try a handsome advertisement for one year, continuously, in THE SCIENTIFIC AMERICAN, Export Edition. Rates, $550 a year for a full page; half page, $300; quarter page, $175; one-eighth page, $100. Half-yearly rates in slightly increased proportion.

Published about the 28th of each month.

Single numbers of THE SCIENTIFIC AMERICAN, Export Edition, 50 cents. To be had at this office and at all the news stores. Subscriptions, *Five Dollars a year;* sent, postpaid, to all parts of the world.

MUNN & CO., PUBLISHERS,
37 PARK ROW, NEW YORK.

AIDS TO DRAWING.—A VALUABLE paper containing: (1) Engravings and Descriptions of the Construction and Use of the PANTAGRAPH, for Accurately and Quickly Copying Drawings, Photographs, Maps, Diagrams, etc., making the Copies larger or smaller or of the same size of the original. Any intelligent person may construct and use the Pantagraph by following the directions here given. (2) Also, Drawings and description for the Construction of the CAMERA LUCIDA, a simple and valuable little instrument for making drawings direct from the object, and in Copying, Enlarging, or Diminishing Drawings, Photographs, etc. (3) Also, Drawings and description of the CAMERA OBSCURA, a simple, effective, and cheaply made little instrument by which Landscapes, Dwellings, and other objects may be easily drawn by any person with accuracy, although unskilled in drawing. (4) Also, THE SKETCHING FRAME, with drawings and descriptions for Construction and Use. A handy contrivance for ladies and others for assistance in outdoor drawing, portraiture, etc. (5) Also, THE REFLECTING DRAWING BOARD. A simple device in which the reflection from a pane of glass is made to throw down upon paper an image of the drawing to be copied; all the operator has to do being to draw the outline before him. (6) Also, THE TRANSPARENT DRAWING TABLE, showing how to construct a drawing board in which the light is thrown under and upward through the drawing, thus greatly facilitating the making of copies of any drawing. (7) Also, THE PROPORTIONAL DIVIDERS; being a simple instrument for enlarging or reducing drawings from one scale to another with Accuracy and Rapidity. (8) Also, THE PERSPECTIVE RULER. A simple device for the Correct and Rapid Drawing of the Perspective lines in Drawing. The construction of all these various instruments is illustrated with engravings, and accompanied by plain, simple directions to enable any person at a small cost to make and use them. This is the most Valuable Paper of the kind ever published. The whole contained in SUPPLEMENT 158. Price 10 cents.

WESTON DYNAMO-ELECTRIC MACHINE CO

Machines for Electro-plating, Electrotyping, Electric Light, etc. In addition to testimonials in our Catalogue of Jan. 1, we beg to refer to the following houses: MERIDEN BRITANNIA CO.; RUSSELL & ERWIN M'F'G CO.; REED & BARTON; HALL, ELTON & CO.; RICHARDSON, BOYNTON & CO.; WM. H. JACKSON & CO.; STANLEY WORKS; ROGERS CUTLERY CO.; CHAS. ROGERS BROS.; EDWARD MILLER CO.; MITCHELL, VANCE & CO.; NORWALK LOCK CO.; HAYDEN, GERE & CO.; DOMESTIC SEWING MACHINE CO.; EBERHARD FABER; JOS. DIXON CRUCIBLE CO.; MUMFORD & HANSON; FAGAN & SON, and over 500 others. Outfits for NICKEL, SILVER, BRONZE, Plating, etc. The two highest CENTENNIAL AWARDS, and the CENTENNIAL GOLD MEDAL of American Institute. **Prices from $125 to $500.** New Catalogue will be out in June.

CONDIT, HANSON & VAN WINKLE
Sole Agents NEWARK, N.J.

COMPLETE SETS OF CHEMICAL AND and Philosophical Apparatus for Students, Amateurs, and Lecture purposes, from 5 dollars upward according to style. Address, for price list, J. E. Stebel, Chicago, Ill.

WARREN'S IMPROVED TURBINE WATER-WHEEL. Send for reduced price list.
29 Exchange St., Boston, Mass.

$300 WORTH HARDWARE. Will exchange for good business opportunity. Give particulars.
DEALER, Brooklyn, E. D., N. Y.

DUC'S ELEVATOR BUCKET,

For use in **Flour Mills, Grain Elevators, Sugar Refineries, etc.** Made of Charcoal stamping Iron, extra strong and durable. No corners to catch. Many thousands in use.

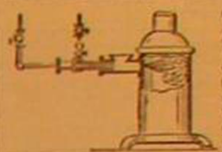
T. F. ROWLAND, Sole Manufacturer, Brooklyn, N. Y.

STEAM PUMPS.

HENRY R. WORTHINGTON,
239 Broadway, N. Y. 83 Water St., Boston.
THE WORTHINGTON DUPLEX PUMPING ENGINES FOR WATER WORKS—Compound, Condensing or Non-Condensing. Used in over 100 Water-Works Stations.
STEAM PUMPS—Duplex and Single Cylinder.

Price list issued Jan. 1, 1879, with a reduction exceeding 30 per cent.

WATER METERS. OIL METERS.



THE FORSTER-FIRMIN GOLD AND SILVER AMALGAMATING COMP'Y of Norristown, Pa., will grant state rights or licenses on easy terms. This system works up to assay, and recovers the mercury rapidly. Apply as above.

THE FOSSIL FORESTS OF THE YELLOWSTONE NATIONAL PARK. By W. H. Holmes. A very interesting and valuable paper descriptive of the remarkable "Volcanic Tertiary" formations of the above region, 5,000 feet in thickness. Illustrated by an engraving of the north face of Amethyst mountain, 9,400 ft. high, the river bed 6,700 ft. high, showing the position of the multitudes of ancient forest tree trunks of gigantic size turned into stone and now standing on the cliffs, together with many other interesting geological particulars. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 180. Price 10 cents. To be had at this office and of all newsdealers.

$777 A YEAR and expenses to agents. Outfit Free. Address P. O. VICKERY, Augusta, Maine.

STEAM PUMPS — Wright's Pat. Bucket Plungers are the best. VALLEY MACHINE CO. Easthampton, Mass.

HOW TO REMOVE STAINS AND Spots from Linen, Cotton, Woolens, and Silk. Being a table of Specific Directions, showing how to proceed in removing from each of the above kinds of goods any stains of the following character, to wit: Stains of Sugar, Glue, Blood, Albumen, Grease, Varnish, Oil, Paints, Stearine, Vegetable Colors, Red Wine, Fruit Stains, Red Ink, Alizarine Ink, Iron Rust, Ink made with Galls, Lime, Lye, Alkali Stains, Tannin, Green Nut Stains, Coal Tar Stains, Wagon Grease, Acid Stains, etc. By means of this valuable table of directions any person, by providing himself with a few simple chemicals, and using them as directed, may readily clean any species of the above goods, and if necessary set up a cleaning shop. This is one of the most convenient and valuable papers on the subject ever published. Contained in SUPPLEMENT 158. Price 10 cents.

---

50 *Latest Style* **CARDS**, *Bouquet, Lawn, Floral,* etc., in case, *name in gold*, 10c. SEAVY BROS., Northford, Ct.

PROSPECTUS

OF THE

Scientific American

FOR 1879.

The Most Popular Scientific Paper in the World.

VOLUME XL.—NEW SERIES.

The publishers of the SCIENTIFIC AMERICAN beg to announce that on the Fourth day of January, 1879, a new volume will be commenced. It will continue to be the aim of the publishers to render the contents of the new volume as, or more, attractive and useful than any of its predecessors.

Only $3.20 a Year including Postage. Weekly. 52 Numbers a Year.

This widely circulated and splendidly illustrated paper is published weekly. Every number contains sixteen pages of useful information, and a large number of original engravings of new inventions and discoveries, representing Engineering Works, Steam Machinery, New Inventions, Novelties in Mechanics, Manufactures, Chemistry, Electricity, Telegraphy, Photography, Architecture, Agriculture, Horticulture, Natural History, etc.

All Classes of Readers find in THE SCIENTIFIC AMERICAN a popular *resume* of the best scientific information of the day; and it is the aim of the publishers to present it in an attractive form, avoiding as much as possible abstruse terms. To every intelligent mind, this journal affords a constant supply of instructive reading. It is promotive of knowledge and progress in every community where it circulates.

Terms of Subscription.—One copy of THE SCIENTIFIC AMERICAN will be sent for *one year*—52 numbers—postage prepaid, to any subscriber in the United States or Canada, on receipt of **three dollars and twenty cents** by the publishers; six months, $1.60; three months, $1.00.

Clubs.—One extra copy of THE SCIENTIFIC AMERICAN will be supplied gratis *for every club of five subscribers* at $3.20 each; additional copies at same proportionate rate. Postage prepaid.

One copy of THE SCIENTIFIC AMERICAN and one copy of THE SCIENTIFIC AMERICAN SUPPLEMENT will be sent for one year, postage prepaid, to any subscriber in the United States or Canada, on receipt of *seven dollars* by the publishers.

The safest way to remit is by Postal Order, Draft, or Express. Money carefully placed inside of envelopes, securely sealed, and correctly addressed, seldom goes astray, but is at the sender's risk. Address all letters and make all orders, drafts, etc., payable to

MUNN & CO.,
37 Park Row, New York.

To Foreign Subscribers.—Under the facilities of the Postal Union, the SCIENTIFIC AMERICAN is now sent by post direct from New York, with regularity, to subscribers in Great Britain, India, Australia, and all other British colonies; to France, Austria, Belgium, Germany, Russia, and all other European States; Japan, Brazil, Mexico, and all States of Central and South America. Terms, when sent to foreign countries, Canada excepted, $4, gold, for SCIENTIFIC AMERICAN, 1 year; $9, gold, for both SCIENTIFIC AMERICAN and SUPPLEMENT for 1 year. This includes postage, which we pay. Remit by postal order or draft to order of Munn & Co., 37 Park Row, New York.

Advertisements.

Inside Page, each insertion - - - 75 cents a line.
Back Page, each insertion - - - $1.00 a line.
(About eight words to a line.)

Engravings may head advertisements at the same rate per line, by measurement, as the letter press. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

The J. L. Mott Iron Works,
88 and 90 BEEKMAN ST.,
Manufacturers of
DEMAREST'S PATENT
WATER CLOSETS.
Simple in construction, perfect in operation, thoroughly excluding all sewer gas, and cleanly in every way.

FOR SALE. 40-lb. Bradley Cushioned Hammer. Sterling Iron Works, Sterling, Ill.

WANTED.—SMALL SECOND-HAND BOILER FOR boat. S. PORCH, Spiceland, Ind.

PARTNER WANTED.—A PRACTICAL foundryman, machinist, or accountant, competent to take charge. Business established in 1869. Best locality in the north-west. Capital required, $5,000. Address SPARTA IRON WORKS, Sparta, Wis.

WILHIDE'S NOISELESS SELF-SETTING RAT AND MOUSE TRAPS.

C. W. Ely, Superintendent Deaf and Dumb Institution, Frederick City, Md., says: "We have used Wilhide's Noiseless Self-Setting Rat Trap, catching 46 rats at one time in one trap, and 14 at another. We catch all the rats that come about the buildings."

WASHINGTON, D. C., Jan. 6, 1879.

GENTLEMEN: We have used the trap you left with us with good success, and doubtless would have caught more rats if the supply had not given out. Respectfully yours, MUNN & CO.,
Patent Solicitors and Editors Scientific American.

Sold by all Dealers. Price $18 per dozen. Discount 20 per cent.
Mouse Traps—Price $6 per dozen. Discount 20 per cent.
Special prices for gross lots. Address all orders to sole owners and manufacturers.
J. T. WILHIDE & BRO.,
York Road, Carroll County, Md.

Mill Stones and Corn Mills.
We make Burr Millstones, Portable Mills, Smut Machines, Packers, Mill Picks, Water Wheels, Pulleys, and Gearing, specially adapted to Flour Mills. Send for catalogue.
J. T. NOYE & SON, Buffalo, N. Y.

EMPIRE THRESHER
MANUFACTURED AT
HAGERSTOWN, MD.
BY THE HAGERSTOWN STEAM ENGINE & MACHINE CO.
THE BEST IN THE WORLD.
SEND FOR CIRCULARS.

Lathes, Planers, Shapers
Drills, Bolt and Gear Cutters, Milling Machines. Special Machinery. E. GOULD & EBERHARDT, Newark, N. J.

"The Standard Thresher of the Vibrator Class." "The Horse Power of the Century." "The Leading Farm Engine in the American Market."
The Three Idols of the Farming Public.
Illustrated pamphlets and price lists sent free to all who apply by mail to THE AULTMAN & TAYLOR COMPANY, Mansfield, Ohio, saying they saw this offer in the SCIENTIFIC AMERICAN.

VENUS, THE EVENING STAR. AN interesting and valuable paper. By Camille Flammarion. Containing a resumé, in popular form, of the Latest Knowledge concerning this wonderful planet, which is nearly of the same size as the earth and only twenty-six millions of miles distant from us. Including an account of the phases of Venus, its remarkable brilliancy, periods when seen in the daytime, its density, probable atmosphere, climate, physical features, deductions concerning life and inhabitants, etc., with one illustration. Contained in SCIENTIFIC AMERICAN SUPPLEMENT No. **177.** Price 10 cents. To be had at this office and of all newsdealers. The same number also contains a valuable paper by Alfred M. Mayer, on the Measurements of the Waves of Light, with a drawing and description of the mode of using the Spectrometer.

WOOD WORKING MACHINERY.
PLANING, MATCHING, MOLDING, MORTISING,
TENONING, CARVING, MACHINES.
BAND & SCROLL SAWS
UNIVERSAL AND VARIETY WOOD WORKERS, &c. &c.
J. A. FAY & CO.
CINCINNATI, O. U. S. A.

PATENTS at AUCTION.
Regular Monthly Sales. For terms, address N. Y. PATENT EXCHANGE, 67 Liberty Street, New York.

The George Place Machinery Agency
Machinery of Every Description.
121 Chambers and 103 Reade Streets, New York.

H. W. JOHNS' ASBESTOS
Liquid Paints, Roofing, Boiler Coverings, Steam Packing, Sheathings, Fire Proof Coatings, Cements, &c. SEND FOR DESCRIPTIVE PRICE LIST.
H. W. JOHNS M'F'G CO. 87 MAIDEN LANE, N.Y.

Park Benjamin's Scientific Expert Office,
37 PARK ROW, NEW YORK.
Advises Inventors on Engineering and Mech. Subjects.

COLUMBIA BICYCLE.
100 miles in 7 hours.
Easy to Learn to Ride.
An ordinary rider can outstrip the best horse in a day's run over common roads. Send 3 cent. stamp for price list and twenty-four page catalogue.
THE POPE MFG. CO.,
89 Summer Street, Boston, Mass.

BAXTER ENGINE FOR SALE.
A second-hand 10-horse power engine, with 15-horse power boiler, in good condition. Will be sold cheap.
PHOTO-ENGRAVING CO.,
67 Park Place, N. Y.

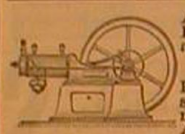
SPARE THE CROTON AND SAVE THE COST.
Driven or Tube Wells
furnished to large consumers of Croton and Ridgewood Water. WM. D. ANDREWS & BRO., 414 Water St., N.Y., who control the patent for Green's American Driven Well.

DOUBLE HULLER Clover Machine

THE "VICTOR."
THE BEST IN THE WORLD.
Send for Descriptive Circular and Price List to HAGERSTOWN AGRICULTURAL IMPLEM'T MFG. CO., Hagerstown, Md. *State where you saw advertisement.*

MICROSCOPES, Opera Glasses, Spectacles, Meteorological Instruments, at greatly reduced prices. Send three stamps for Illustrated Catalogue. R. & J. BECK, Philadelphia, Pa.

MACHINISTS' TOOLS.
NEW AND IMPROVED PATTERNS.
Send for new illustrated catalogue.
Lathes, Planers, Drills, &c.
NEW HAVEN MANUFACTURING CO.,
New Haven, Conn.



An engine that works without Boiler. Always ready to be started and to give at once full power.
SAFETY. ECONOMY, CONVENIENCE.
Burns common Gas and Air. No steam, no coal, no ashes, no fires, no danger, no extra insurance. Almost no attendance.
THE NEW OTTO SILENT GAS ENGINE.
Useful for all work of small stationary steam engine. Built in sizes of 2, 4, and 7 H. P. by SCHLEICHER, SCHUMM & CO., 305 Chestnut Street, Phila., Pa. H. S. Manning & Co., 111 Liberty St., N. Y., Agents.

NEW AND 2D-HAND ENGINES AND BOILERS CHEAP for cash. O. B. GOODWIN, Oil City, Pa.

AIR ENGINES.
No water. No Engineer. Absolutely Safe. Most economical and convenient power known. SHERRILL ROPER AIR ENGINE CO., 91 & 93 Washington St., N.Y.

DEAN BROTHERS,
INDIANAPOLIS, IND.,
Manufacturers of
Dean Steam Pumps
Boiler Feeders and Pumping Machinery for all purposes.

MINING MACHINERY. Engines, Boilers, Pumps, Coal and Ore Jigs, Dust Burning Appliances. Drawings and advice free to customers. Jeanesville Iron Works (J. C. Haydon & Co.). Address HOWELL GREEN, Supt., Jeanesville, Luzerne Co., Pa.

ICE AT $1.00 PER TON.
The PICTET ARTIFICIAL ICE CO.,
LIMITED,
Room 51, Coal and Iron Exchange, P. O. Box 3083, N. Y.

THE SKINNER PORTABLE & STATIONARY ENGINES BOILERS & GOVERNORS
FIRST CLASS & ECONOMICAL SKINNER & WOOD, ERIE, PA.
SEE ILLUSTRATED ADVERTISEMENT

Cigar Box Lumber,
MANUFACTURED by our NEW PATENT PROCESS.
The Best in the World.
SPANISH CEDAR,
MAHOGANY,
POPLAR.
Also thin lumber of all other kinds, ¼ to ⅜ in., at corresponding prices. All qualities. Equal in all respects to any made, and at prices much under any to be obtained outside of our establishment. Send for price list.
GEO. W. READ & CO.,
186 to 200 Lewis Street, N. Y.

Wood-Working Machinery,
Such as Woodworth Planing, Tonguing, and Grooving Machines, Daniel's Planers, Richardson's Patent Improved Tenon Machines, Mortising, Moulding, and Re-Saw Machines, Eastman's Pat. Miter Machines, and Wood-Working Machinery generally. Manufactured by WITHERBY, RUGG & RICHARDSON,
26 Salisbury Street, Worcester, Mass.
(Shop formerly occupied by R. BALL & CO.)

$3 Printing Press
Prints cards labels &c. (Self-inker $5) 18 larger sizes For business or pleasure, young or old. Do your own advertising and printing. Catalogue of presses, type, cards, &c., for 2 stamps. Kelsey & Co. Meriden, Conn

DIES FOR EVERY PURPOSE.
STILES & PARKER PRESS CO., Middletown, Ct.

EAGLE TUBE CO.,
614 to 626 W. 24th St., New York.
BOILER FLUES of all the Regular Sizes,
Of Best Material and Warranted.
ORDERS PROMPTLY EXECUTED.
No Payment Required till Tubes are Fully Tested and Satisfactory.

HARTFORD
STEAM BOILER
Inspection & Insurance
COMPANY.
W. B. FRANKLIN, V. Pres't. J. M. ALLEN, Pres't.
J. B. PIERCE, Sec'y.

Bookwalter Engine.
Compact, Substantial, Economical, and easily managed; guaranteed to work well and give full power claimed. Engine and Boiler complete, including Governor, Pump, etc., at the low price of
3 HORSE POWER.....$215 00
4½ " " 245 00
6½ " " 315 00
Put on cars at Springfield, O.
JAMES LEFFEL & CO.,
Springfield, Ohio.
or 110 Liberty St., New York.

IMPORTANT FOR ALL CORPORATIONS AND MANF'G CONCERNS.—**Buerk's Watchman's Time Detector,** capable of accurately controlling the motion of a watchman or patrolman at the different stations of his beat. Send for circular.
J. E. BUERK, P. O. Box 979, Boston, Mass.
Beware of buying infringing Detectors.

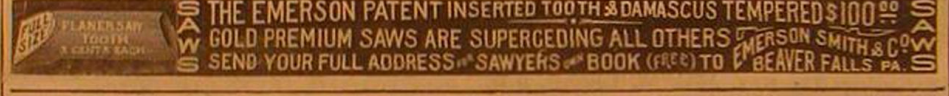
TO LARGE CONSUMERS OF FINE LIGHT
Malleable and Gray Iron Castings,
We can offer special inducements in the way of VERY SUPERIOR QUALITY GUARANTEED, and at fair prices. Being ourselves large consumers and requiring the most perfect castings, other work is insured the same attention. Mallory, Wheeler & Co., New Haven, Conn.

60 Cards—30 Chromo, 10 Motto, 30 Ocean Shells, Snowflake, etc., Name on, 10c. Clinton Bros. Clintonville, Ct.

Roots' Improved Portable Forge

P. H. & F. M. ROOTS, M'f'rs, Connersville, Ind.
S. S. TOWNSEND, Gen. Agt., } 6 Cortlandt St.
COOKE & BECGS, Sell'g Agts., } NEW YORK,
SEND FOR PRICED CATALOGUE.

$10 to $1000 Invested in Wall St. Stocks makes fortunes every month. Books sent free explaining everything.
Address BAXTER & CO., Bankers, 17 Wall St., N.Y.



BALDNESS.—BY GEORGE H. ROHE, M.D. A brief but Highly Useful paper, showing the causes of Baldness, how Dandruff is produced, why the Hair falls off, with explanations of Kafosi's Prompt and Effectual Remedy and Recipe for the same; together with Directions and General Advice for Preventing Baldness, Restoring and Preserving the Hair. This is one of the most Useful, Practical, and Valuable Papers concerning the Treatment of Baldness ever published. Contained in SUPPLEMENT **161.** Price 10 cents.

J. LLOYD HAIGH,
Manufacturer of
WIRE ROPE
of every description, for Railroad and Mining Use, Elevators, Derricks, Rope Tramways, Transmission of Power, etc. No. 81 John St., N. Y. Send for price list. Plans and Estimates furnished for Suspension Bridges.

PERFECT
NEWSPAPER FILE
The Koch Patent File, for preserving newspapers, magazines, and pamphlets, has been recently improved and price reduced. Subscribers to the SCIENTIFIC AMERICAN and SCIENTIFIC AMERICAN SUPPLEMENT can be supplied for the low price of $1.50 by mail, or $1.25 at the office of this paper. Heavy board sides; inscription "SCIENTIFIC AMERICAN," in gilt. Necessary for every one who wishes to preserve the paper.
Address
MUNN & CO.,
Publishers SCIENTIFIC AMERICAN

BEST AND CHEAPEST FOOT POWER SCREW CUTTING ENGINE LATHES
SEE FULL DESCRIPTION IN SCIENTIFIC AMERICAN, JULY 27
SEND FOR ILLUSTRATED CATALOGUE
GOODNOW & WIGHTMAN
176 WASHINGTON ST BOSTON MASS.

SHAFTING, PULLEYS, HANGERS, etc.
a specialty. Send for Price List to
A. & F. BROWN, 57-61 Lewis Street, New York.

AGENT WANTED
IN EVERY COUNTY.
RELIABLE, INTELLIGENT BUSINESS MEN can clear $1,000 to $3,000 yearly in the NEW AGENCY. Entirely new and desirable—pleasant and permanent. Can be carried on in connection with a store, shop, or mill, or by any good agent. Suitable for every county in the United States.
Address
J. B. CHAPMAN,
70 WEST STREET, MADISON, IND.

Retail 9 CENTS per pound.

Established 1843.
Steel Horn, warranted not to break, and Face of *Best Cast Steel.*
Warranted of the hardest temper, and never to settle.
Better than any English make, and only one that is fully
!! WARRANTED !!
50 sizes, from 1-2 lb. to 800 lbs.
Catalogues furnished on application.

THE TANITE CO., STROUDSBURG, PA.
EMERY WHEELS AND GRINDERS.
LONDON—9 St. Andrews St., Holborn Viaduct, E. C.
LIVERPOOL—42 The Temple.

ROCK DRILLING MACHINES AND AIR COMPRESSORS.
MANUFACTURED BY BURLEIGH ROCK DRILL CO.
SEND FOR PAMPHLET. FITCHBURG MASS.

HOUSE DRAINS AND THEIR COMMON DEFECTS.—By Eliot C. Clarke, C.E., Principal Assistant Engineer in charge of the Improved Sewerage Work, Boston, Mass. With 34 illustrations. An Important and Valuable Paper, showing the Essential Conditions for Efficient House Drainage; the proper sizes, forms, and best materials for drains; the evil results of making them too large; the proper inclination for drains; the best methods of making them tight; the right and the wrong methods of connecting drains with sewers, with engravings. How leaks in drains occur and how detected. Descriptions of the most common defects in drains, with engravings. Together with many valuable suggestions and directions of great value to housekeepers and owners of property, whether in town or country. This paper is based on the observations of the author during an extended experience in the actual construction of drains and sewers, and presents in concise form the latest and best information on the subject. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, number **179.** Price 10 cents. To be had at this office and of newsdealers everywhere.

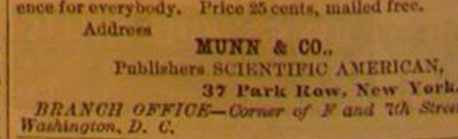
WIRE ROPE
Address JOHN A. ROEBLING'S SONS, Manufacturers, Trenton, N. J., or 117 Liberty Street, New York.
Wheels and Rope for conveying power long distances. Send for circular.

Working Models
And Experimental Machinery, Metal or Wood, made to order by J. F. WERNER, 62 Centre St., N. Y.

WATSONS NON CHANGEABLE GAP LATHE HAS GREAT FACILITIES FOR LARGE OR MEDIUM SIZE WORK. JAMES WATSON 1608 S. FRONT ST. PHILA.

THE DRIVEN WELL.
Town and County privileges for making Driven Wells and selling Licenses under the established American Driven Well Patent, leased by the year to responsible parties, by
WM. D. ANDREWS & BRO.,
NEW YORK.

HAND SAW MILL SAVES THREE MEN'S labor. S. C. HILLS, 78 Chambers St., N. Y.



CAVEATS, COPYRIGHTS, TRADE MARKS, ETC.

Messrs. Munn & Co., in connection with the publication of the SCIENTIFIC AMERICAN, continue to examine Improvements, and to act as Solicitors of Patents for Inventors.

In this line of business they have had OVER THIRTY YEARS' EXPERIENCE, and now have *unequaled facilities* for the preparation of Patent Drawings, Specifications, and the Prosecution of Applications for Patents in the United States, Canada, and Foreign Countries. Messrs. Munn & Co. also attend to the preparation of Caveats, Trade Mark Regulations, Copyrights for Books, Labels, Reissues, Assignments, and Reports on Infringements of Patents. All business intrusted to them is done with special care and promptness, on very moderate terms.

We send free of charge, on application, a pamphlet containing further information about Patents and how to procure them; directions concerning Trade Marks, Copyrights, Designs, Patents, Appeals, Reissues, Infringements, Assignments, Rejected Cases, Hints on the Sale of Patents, etc.

Foreign Patents.—We also send, *free of charge*, a Synopsis of Foreign Patent Laws, showing the cost and method of securing patents in all the principal countries of the world. American inventors should bear in mind that, as a general rule, any invention that is valuable to the patentee in this country is worth equally as much in England and some other foreign countries. Five patents—embracing Canadian, English, German, French, and Belgian—will secure to an inventor the exclusive monopoly to his discovery among about ONE HUNDRED AND FIFTY MILLIONS of the most intelligent people in the world. The facilities of business and steam communication are such that patents can be obtained abroad by our citizens almost as easily as at home. The expense to apply for an English patent is $75; German, $100; French, $100; Belgian, $100; Canadian, $50.

Copies of Patents.—Persons desiring any patent issued from 1836 to November 26, 1867, can be supplied with official copies at reasonable cost, the price depending upon the extent of drawings and length of specifications.

Any patent issued since November 27, 1867, at which time the Patent Office commenced printing the drawings and specifications, may be had by remitting to this office $1.

A copy of the claims of any patent issued since 1836 will be furnished for $1.

When ordering copies, please to remit for the same as above, and state name of patentee, title of invention, and date of patent.

A pamphlet, containing full directions for obtaining United States patents sent free. A handsomely bound Reference Book, gilt edges, contains 140 pages and many engravings and tables important to every patentee and mechanic, and is a useful hand book of reference for everybody. Price 25 cents, mailed free.
Address
MUNN & CO.,
Publishers SCIENTIFIC AMERICAN,
37 Park Row, New York.
BRANCH OFFICE—Corner of F and 7th Streets, Washington, D. C.

THE "Scientific American" is printed with CHAS. ENEU JOHNSON & CO.'S INK. Tenth and Lombard Sts., Philadelphia, and 50 Gold St., New York.