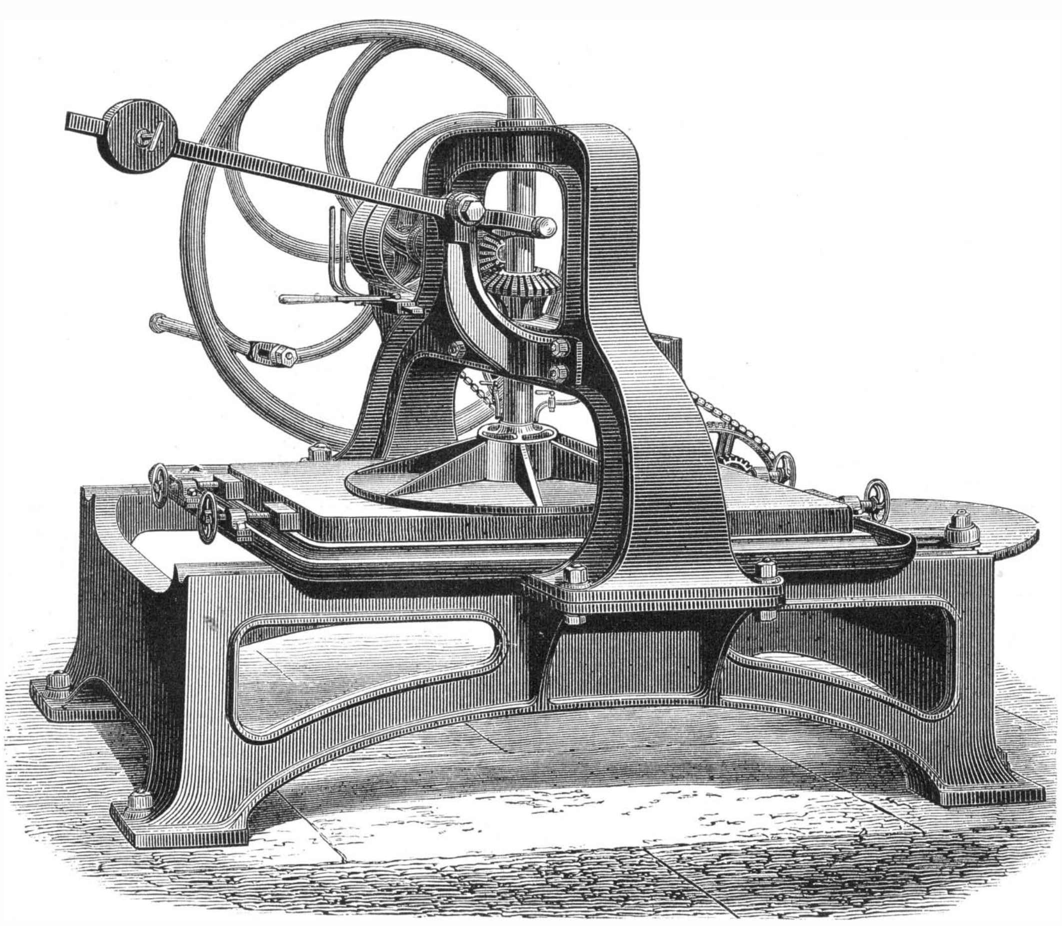
SCIENTIFIC AMERICAN

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

Vol. XXXVI.—No. 20. [NEW SERIES.] | NEW YORK, MAY 19, 1877. | $3.20 per Annum. [POSTAGE PREPAID.]

NEW LITHOGRAPHIC STONE-DRESSING MACHINE.

Lithographic stone is an argillaceous limestone, of a color varying from light buff to a pearl gray. It is quarried in mass, and is split or sawn into slabs of two or three inches in thickness and of any required size. To prepare the stone for use, it is ground to a perfectly uniform face; and then, if the drawing is to be in crayon, a grained surface is produced by rubbing two stones together, fine or coarse sand and water being introduced, according to the nature of the face desired. If the drawing is to be in ink, the surface is polished; but if it is to be in crayon and quite coarse, as is the case with the elegant theatrical show-bills now made by this process, a comparatively rough face is needed. The labor of polishing is done by hand, and it is quite severe, necessitating in most establishments a workman who devotes his time to that alone. A machine has recently been devised for this purpose by MM. Perron and Dehaitre, the annexed engraving of which we extract from the *Revue Industrielle*. It has been found especially useful in working upon large stones, and is said to be capable of performing the labor of six men, and to need but one person to rotate the crank. It also substitutes a uniform pressure in lieu of the variable one exerted by the hand, and thus allows of the production of stones having a much truer face. The construction is exceedingly simple, and requires but little description. The crank wheel actuates bevel gearing, rotating a vertical shaft which carries the grinding disk. The shaft is weighted as shown, and the stone is adjusted on the carriage of the machine by clamps. The carriage moves in ways on the bed, and is caused to travel gradually from end to end of the latter by a simple feed motion actuated by a chain belt from the crank arbor. Pulleys are provided for belting for the application of steam power, and a small pipe leads the water supply from any suitable reservoir.



PERRON AND DEHAITRE'S STONE DRESSER.

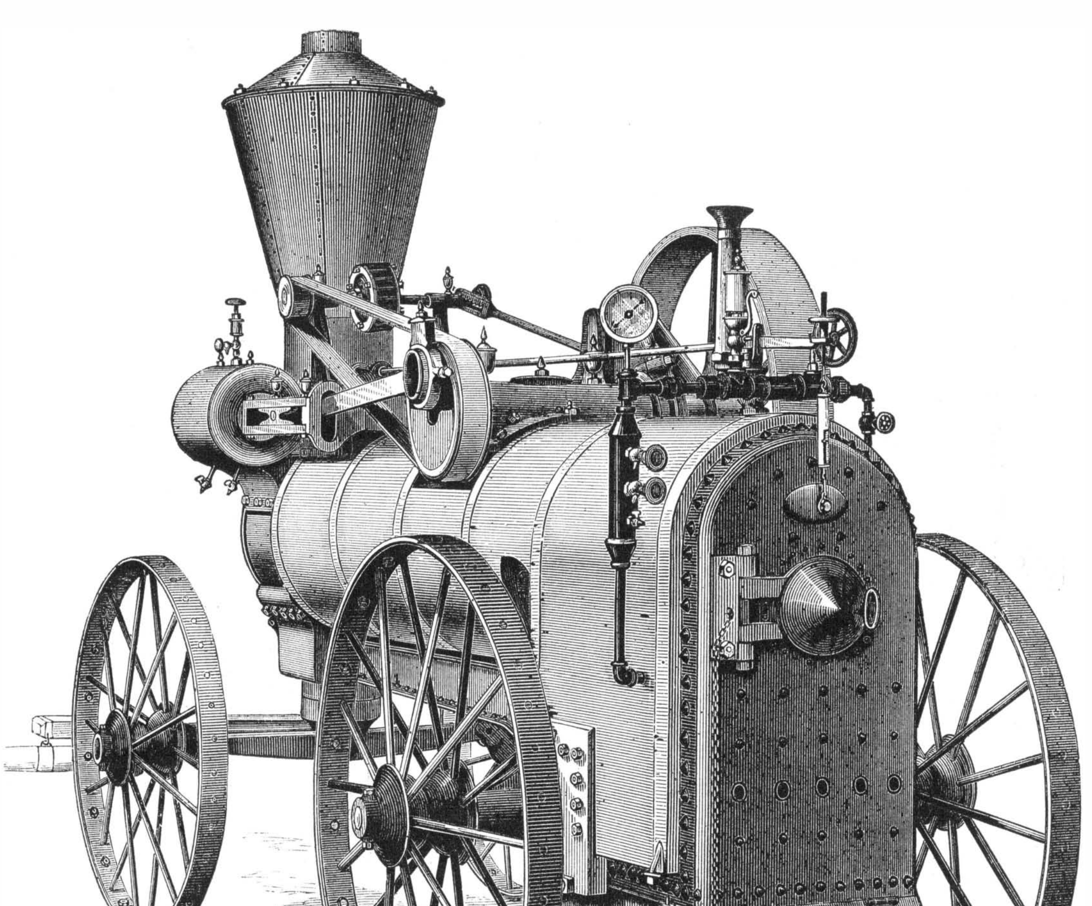
PORTABLE STEAM ENGINE.

The war in Europe, which has just begun, cannot fail to create a greatly increased demand for American breadstuffs; and as the prospects for the grain crop, as reported from all sections of the country, were never better, our farmers will doubtless require more steam engines this year than ever before. The engine herewith illustrated is well adapted to farm and plantation purposes. It differs from others of its class in the arrangement of the engine on the boiler. The steam cylinder has a broad base, which is fastened to the smoke box by bolts, so as to prevent leakage of steam, however great the strain. Connecting the cylinder with the saddle which supports the crank shaft are two wrought iron bars, constituting the framing, which receive the working stress of the engine. The free expansion of the boiler under all pressures is provided for by the arrangement of the saddle, which is not fastened to the boiler. The condensing feedwater heater is placed directly under the boiler, and the feed pump is located below the water line in tank and heater. A single eccentric drives the pump and steam valve. The governor is driven directly from the crank wheel, without any carrying pulleys, as will be seen in the engraving, and will work equally well in any position. The speed of the engine can be quickly and readily changed by the engine driver without leaving his usual place. The cylinder is fitted with a balanced valve and automatic cut-off, which adjusts itself to do the work required with economy. The steam dome is large and high, and is located directly on top of the steam chest and within the smoke stack. The road wheels are entirely of wrought iron with the exception of the hubs. The wearing surfaces in this engine are large. The driver's seat, being on the opposite side of the engine, does not show in this engraving.

We learn from the manufacturers that a thrasherman in Iowa, who has run one of the Mills engines for three years, states that he has thrashed one thousand bushels of wheat from long straw with one quarter of a cord of wood and ten barrels of water. In another case, a similar result was obtained with less than five hundred lbs. of soft coal. Other good results, similar to the above, are reported. We are also informed that a trial of a fifteen horse power Mills engine, made last year by Mr. William Barnet Le Van, of Philadelphia, Pa., fixed the duty at two and nine tenths lbs. of combustible, and twenty-six and eight tenths lbs. of water, per indicated horse power per hour. The engineer will perceive that this duty is remarkably high This economy has been accomplished without increasing the total weight of the engine.

As far back as the Vienna Exposition, Professor R. H. Thurston, then acting as Commissioner for this country, stated in his report on portable steam engines that, although the English builders were far in advance of all others exhibiting, the Mills engine rivalled the best of them.

The engine is made in three different styles, namely, the mounted farm engine as shown in the engraving, the self-moving or thrasher's locomotive, and the self-contained or semi-portable for stationary purposes. For prices and other particulars, address the Fishkill Landing Machine Company, Fishkill-on-the-Hudson, N. Y., or Thomas J. Fales, 18 Park Place, New York, agent for foreign countries.



MILLS' PORTABLE STEAM ENGINE.

Helpful Sympathy.

A newspaper editor in the mining regions of Pennsylvania philosophically observes: "When a man gets both of his legs mashed, rendering him unable to work for three months, there's nothing that cheers him up so much, and so effectually keeps the wolf from the door, as for his fellow-workmen to pass a series of resolutions praying for his speedy recovery, and ordering an engrossed copy of the same to be presented to his family."

ARTIFICIAL coral can be made of 4 parts yellow resin and 1 part vermilion, melted very fine.

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.

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.

☞ Subscriptions received and single copies of either paper sold by all the news agents.

Publishers' Notice to Mail Subscribers.

Mail subscribers will observe on the printed address of each paper the time for which they have prepaid. Before the time indicated expires, to insure a continuity of numbers, subscribers should remit for another year. For the convenience of the mail clerks, they will please also state when their subscriptions expire.

New subscriptions will be entered from the time the order is received; but the back numbers of either the SCIENTIFIC AMERICAN or the SCIENTIFIC AMERICAN SUPPLEMENT will be sent from January when desired. In this case, the subscription will date from the commencement of the volume, and the latter will be complete for preservation or binding.

VOL. XXXVI., No. 20. [NEW SERIES.] *Thirty-second Year.*

NEW YORK, SATURDAY, MAY 19, 1877.

Contents.

(Illustrated articles are marked with an asterisk.)

TABLE OF CONTENTS OF
THE SCIENTIFIC AMERICAN SUPPLEMENT,

No. 72,

For the Week ending May 19, 1877.

Terms:—SCIENTIFIC AMERICAN SUPPLEMENT, one year, postpaid, *five dollars*. One copy of SCIENTIFIC AMERICAN and one copy of SCIENTIFIC AMERICAN SUPPLEMENT, one year, postpaid, *seven dollars*. CLUBS.—One extra copy of the SUPPLEMENT will be supplied gratis for every club of five SUPPLEMENT subscribers at $5.00 each.

All the back numbers of the SUPPLEMENT, from the commencement, January 1, 1876, can be had. Price 10 cents each.

NOW READY.—The SCIENTIFIC AMERICAN SUPPLEMENT for 1876. Complete in two large volumes. Over 800 quarto pages; over 2,000 engravings. Embracing History of the Centennial Exhibition. New Illustrated Instructions in Mechanical Drawing. Many valuable papers, etc. Price five dollars for the two volumes, stitched in paper; or six dollars and fifty cents, handsomely bound in stiff covers.

RECENT IMPROVEMENTS IN PHOTOGRAPHY.

Two interesting improvements, of promising practical importance, have of late been made public. The first relates to the production of negatives, for gallery and other work, without the use of the nitrate of silver bath.

The common method of photography, that universally practised in all galleries for portraiture, and for the best outdoor work, is known as the wet plate process. It consists in sensitizing the collodion plate by dipping in a liquid charged with nitrate of silver. The sensitization is effected in about three minutes' time; the plate is then withdrawn from the bath, quickly placed in the camera, and the picture taken and developed before the plate has time to dry. When all the chemicals are in good order, the bath pure, the exposure rightly timed, and the development skilfully done, the most beautiful results are produced. Indeed, there seems to be no room for improvement in picturesque details, as realized by the best wet plate operators.

But the method is attended with many inconveniences and irksome details. The gallery photographer must keep in readiness a first-class bath, the purity of which is lessened by every plate that goes in; and the bath soon requires renovation. The plates cannot be prepared and sensitized so as to be ready for use in advance of the opening of the day's business, but must be prepared and developed after the customer comes. Should the negative prove unsatisfactory, a new plate must be prepared and developed; and thus the bother of the plates involves the loss of so much time that the operator has little chance to consider the best positions for his subject or to study the artistic accessories that go to make up a finished picture. For outdoor work, wherever the photographer goes, he must lug his bath along, even to the mountain top, and must there have a dark tent, and water for washing and developing; otherwise his efforts are fruitless. For several years past it has been the study of photographers to discover a reliable method of preparing highly sensitive plates without the use of the bath—a method by which the plates could be used when dry. Among the results of these efforts are a variety of dry plate processes, some of which, in the hands of skilled operators, yield excellent results. But nearly all of them have proved less sensitive or less excellent in their results than the wet process; and none have been able to compete with the latter for portraiture or gallery work.

The French Photographic Society in 1876 offered a prize for the best dry process which should unite rapidity with all the other qualities that go to make a good negative. The competion was closed in December last, and the jury have recently awarded the prize to Mr. Alfred Chardon. The process appears to have advantages over some of its predecessors, but there are inconvenient details about the development and some uncertainty in the summering and wintering of the emulsion; while the prepared plates require twice as much time for taking the picture as the wet plate. Moreover, the process is not suitable for the ordinary routine work of the gallery.

The author of the new process which we have now to describe, and to which we would direct the attention of photographers as a complete and perfect substitute for the wet process, both for indoor, gallery, portrait, outdoor work, and all descriptions of photography, is Mr. Henry J. Newton, of this city, President of the Photographic Section of the American Institute.

We have seen the process worked under the author's hands and examined some of the results. We believe that practical photographers, when they come to examine the negatives and prints, will agree with us when we say that they are unsurpassed by anything as yet produced by the wet process. They will also agree with us that Mr. Newton's process is simpler, quicker, easier, less expensive, and more certain in the excellence of results than the old method. Moreover, for gallery and outdoor work, it presents the striking advantage of enabling the photographer to prepare in advance a stock of sensitive plates, and of keeping them on hand ready for instant use when wanted.

The Newton is an emulsion process. The silver is mixed with the collodion, which remains good for use at any time within a year or more. A glass plate is flowed with this collodion in the usual manner; the plate is then dipped in water; it is then ready for use either before or after drying. The picture being taken, it is developed by simply flowing the plate, in the ordinary manner, with a solution of carbonate of soda and pyrogallic acid; then fixed with hypo. or cyanide as usual. This is all the manipulation required for the most beautiful, clean, and splendid negatives. As to sensitiveness, the Newton plates require, in the gallery, less than half the time necessary for wet plates. Portraits by the Newton plates are taken in from five to ten seconds; while the wet process, same light and lenses, requires from twenty to forty seconds. For outdoor work, the Newton plates yield as good or better instantaneous pictures than wet plates.

The exact formula for the emulsion has not yet been made known by Mr. Newton, but will in due time be freely given to the public. It is sufficient for the present to say that the emulsion is prepared with an excess of free nitrate of silver, which is allowed to remain for a certain number of hours, when chlorides are added. The Scoville Manufacturing Company of this city supply the new emulsion, with practical directions for its use.

The second photo improvement relates to printing, and is that of Mr. William Willis, Jr., of Birmingham, England. The surface of the paper, sized with arrowroot, is first moistened for a moment with nitrate of silver solution (six grains to the ounce) and dried. In this condition, the paper keeps for any length of time. The paper is further sensitized by coating with a solution of chloro-platinite of potassium and a solution of ferric oxalate. It is then exposed under the negative for only one sixth of the time required for a common silver print. The picture is then toned with gold, treated with hypo., washed, and finally placed in a weak solution of oxalic acid, again washed and dried. The permanency of these prints is remarkable. Mr. T. Rodger recently submitted specimens to the Edinburgh Photographic Society, which he said he had put to extreme tests. One of them, for example, had been subjected to sulphuretted hydrogen for twelve hours, and then to twelve additional hours in the acid solution employed to form the gas, all without change. We have lately had the pleasure of examining some of these platinum prints, brought to this country by the author, which in tone and color, were in every way equal to the best silver prints.

NEURALGIC STORM BELTS.

Dr. S. Weir Mitchell, a physician of Philadelphia, Pa., has recently conducted an important series of very interesting investigations with reference to the relations of bodily pain to the weather. It is an old popular idea that diseases and injuries of the bones, chronic rheumatisms, and ancient wounds produce a renewed pain on the approach of a storm; so much so, indeed, that persons thus afflicted frequently are able to predict impending changes of weather with remarkable accuracy. In the course of study of many of the curious symptoms belonging to the stumps of amputated limbs, Dr. Mitchell frequently encountered the above notion; and he became so impressed by the repeated testimony of patients, who stated that their comfort depended largely on the state of the weather, that he resolved to undertake careful research into the subject. He was fortunate enough to obtain the cooperation of Captain Catlin, U.S.A., who had lost a leg in action during the war, and had become a sufferer with neuralgia in the stump, the pain seemingly residing in portions of the absent foot. This officer kept records of his painful sensations, in connection with the weather reports as shown by the Signal Service, for three years; and he prepared elaborate maps and charts, showing just how certain attacks corresponded to certain periods of barometric depression and other meteorological phenomena. In brief, he conducted his self-examination with an accuracy and scientific thoroughness which cannot be too highly commended.

The result now adduced by Dr. Mitchell is that there is every reason to believe that the popular view which relates some pain fits to storms has a distinct foundation; but that, as the single element of mischief has not been detected, he is driven to believe that it is the combination of atmospheric conditions which starts the pain into being. The separate factors of storms, such as lessened pressure, rising temperature, greater humidity, and winds, appear as a rule to be incompetent, when acting singly, to give rise to attacks of pain. Either it is, as above stated, a combination which provokes the pain, or it may be some as yet unknown agency, acting alone. It was observed by Captain Catlin that his sensations of pain prevailed when the aurora was intense. Whether this was due to the magnetic or electric disturbance prevalent or to the succeeding storm, Dr. Mitchell thinks is questionable.

About the most striking conclusion reached is that relating to the neuralgic storm belt. Every storm, as it sweeps across the continent, consists of a vast rain area, at the center of which is a moving space of greatest barometric depression known as the storm center, along which the storm moves like a bead on a thread. The rain usually precedes this by 600 miles; but before and around the rain lies a belt, which may be called the neuralgic margin of the storm, and which precedes the rain by about 150 miles. This fact is very deceptive, because the sufferer may be on the far edge of the storm basin of barometric depression, and, seeing nothing of the rain, may yet have pain due to the storm. "It is somewhat interesting," adds Dr. Mitchell, "to figure one's self thus—a moving area of rain girdled by a neuralgic belt 150 miles wide, within which, as it sweeps along in advance of the storm, prevail, in the hurt and mained limbs of men and in tender nerves and rheumatic joints, renewed torments called into existence by the stir and perturbation of the elements."

A NEW EXPLOSIVE COMPOUND FOR LARGE GUNS.

The dangerous element to a gun, from any explosion taking place within it, is the rate at which that explosion occurs. Stress due to a blow is very much more difficult to resist than strain gradually applied; and for this reason it is that the slow burning and comparatively weak gunpowder is retained when so many much more powerful explosives exist. No gun has yet been invented capable of withstanding the effects of explosion of gun cotton charges for any length of time, although abundant experiment has been made in this direction in the hope of substituting gun cotton for gunpowder. It is known that an immense advantage would be gained if the whole force of a nitroglycerin explosion could be concentrated on the base of a projectile; but the trouble is that no one has discovered how to harness nitroglycerin for artillery purposes; or in other words, no one has yet devised an apparatus whereby nearly the whole power of the explosion can be directed upon the ball, and merely a minimum left to act towards rending the gun asunder.

It follows from this that the theoretically most advantageous explosive for gunnery purposes is one which has an accelerating action, and that it must focus its power upon the projectile, in a relatively gradual scale, through all the stages, and thus impart to the same the utmost possible velocity. Now, in the case of gunpowder, there is regular combustion, layer by layer; and the amount of gas developed depends directly upon the extent of the burning surface. Consequently, if the size of the grains be increased, the weight of the charge remaining the same, there will be less surface exposed to combustion, less gas evolved in the first instants of time, and less pressure on the gun. In gun cotton, however, there is, in lieu of combustion, a disintegration which occurs instantly throughout the entire mass; and thus, while the explosion of powder is such that it may be easily controlled, no mode of preparing gun cotton in any particular shape changes its peculiarity of instant detonation.

When a grain of gunpowder is fired in the gun, the first gas that is evolved starts the projectile; and as the latter travels, the combustion area of the powder is constantly augmented until, by the time the flame reaches the interior of the grain, the small remainder of the same is incompetent to evolve by its combustion gas enough to compensate for the increased area over which it must act. Hence that nucleus of the grain serves no useful purpose, and certainly affords no acceleration to the shot: but in the new "compensating" powder, which Captain Charles A. L. Totten, U.S.A., has devised, this nucleus is made to render an accelerating force through being formed of gun cotton, which, exploding in an increased area, exerts little strain on the gun, and checks the tendency of the gas to lose its tension, thus compensating for the increasing space in rear of the projectile. Not only does the inventor claim for this compound explosive high impulsive power, but he states that the waste of large grained powder, which is blown out of the gun with the grain still burning, often reaches 60 per cent of the charge, and that this is saved by the addition of the gun cotton nucleus. In general, he affirms that the combined gun cotton and powder is lighter, and four and a half times more effective, charge for charge, than gunpowder. If this can be substantiated by experiment, there can be little question but that the new explosive will be of the greatest value in modern large artillery, in which gunpowder has been proved too weak to project the immense shot and shell with proper effective velocity. Captain Totten finds, by test, that no chemical change attributable to the mutual action of gunpowder and gun cotton occurs in his powder. The gun cotton nucleus is spherical, and half an inch in diameter, the powder envelope raising the diameter to one inch. No special machinery has yet been invented for its manufacture.

We may add that the present is the time for inventors to turn their attention to inventions of this class. The war in Europe will result in a great demand for improved arms and explosives of all kinds; and an efficient substitute for gunpowder in cannon, which shall be much stronger in its effects and at the same time as easily controlled, would be of the greatest value to both contending parties.

WHY FRESH WATER FISH CANNOT LIVE IN SALT WATER.

It is well known that fresh water fish cannot live in salt water, and *vice versa;* and it has been supposed that the reason existed in some poisonous effect which the inappropriate water exerted. M. Paul Bert has recently been investigating this subject, and his conclusion is that the death of the creature is not due to any toxic action, but is simply a phenomenon of osmosis or transmission of fluids through the membranes. In order to prove this, it is only necessary to weigh the animal before and after the experiment. A frog, for example, plunged in sea water loses one third its weight. If only the foot of the frog be introduced, the blood globules can be seen to leave the vessels and distribute themselves under the skin. If an animal be taken, the skin of which is not entirely osmotic, the same phenomena occur in the bronchial system.

There are certain fish, however, which exist sometimes in salt, sometimes in fresh, water, changing their habitat in different periods of life or of the year. It therefore, in view of the above, becomes interesting to see how M. Bert applies his discovery to such apparent exceptions to the general rule. A fresh water salmon, for instance, plunged abruptly in sea water, resists the effects longer than other fresh water fishes; but he dies within five or six hours. This shows, according to M. Bert, that the fish never proceed suddenly from fresh to salt water, but enter brackish water where the tide ebbs and flows, and live there a sufficient time to habituate themselves to the change. This accounts for the frequent discovery of large numbers of such migratory fish in the vicinity of the mouths of the rivers which they ascend.

A fresh water eel, plunged in salt water, does not seem to be affected. But in investigating the peculiarities of this species, M. Bert was led into a wrong conclusion, which may be cited to show how easy it is, often by pure accident, to reach an erroneous determination in laboratory experimenting. After having himself placed several fresh water eels in salt water, he found, as already stated, that they remained alive and unharmed. Wishing to continue the experiments, he directed his assistant to introduce the fish, and report results. To his surprise, the eels then persistently died after a three or four hours' sojourn in salt water, and long search failed to discover the reason why it was that, when M. Bert placed them in the tanks, they lived, while, when the assistant did so, they perished. Finally M. Bert found that his assistant, doubtless on account of the slipperiness of the eels, lifted them with a piece of cloth in his hand. The cloth rubbed off a little of the natural slime of the animal, which protected it from the salt water. Osmosis then occurred in the denuded portion, and the eel eventually died.

The converse experiment, of inserting sea fish in fresh water, produced analogous results. The gills were the seat of alterations, the same as those noted in fresh water fish placed in salt water. M. Bert also observed that the life of the sea fish could be prolonged by adding salt to the fresh water, thus adding further confirmation to his theory.

"LOST HIS AMBITION."

We met, the other day, an expert workman who said that he had lost his ambition. "Where is my incentive?" said he. "I am only a mortal, just like other men. Energy among others is a means to an end. Health, fame, ease, and luxury are the prizes for which men strive. Show me the man who is energetic in a single cause in which one of these is not the aim, the incentive, and the reward, and answer me honestly how can I make an exercise of more than common energy or industry subservient towards giving me one of these prizes."

"You will never be out of work and will always command respect," was the answer. He smiled, and holding a scraper in one hand and a file in the other, replied: "I never was out of work a day; I am too well known. I put forth my energy when I want work, and get it at once. Having got it, I work along easily and pleasantly; am always on the best of terms with my employer, get the best wages, work ten hours a day, and jog discontentedly along, my ambition, energy, and extra ability rusting away for want of the incentive which all men require to call forth more than ordinary exertion. Now, where is my remedy?" "Piecework," was the suggestion made in reply.

"You have struck it," was the response. "When I worked on piecework, the work I did seemed mine; every job well done brought me more work; I engaged other men, and taught the boys all I knew; every scrap of information I gave to my men or boys brought me in money by increasing their skill; every extra dozen blows I struck were represented in my wages on Saturday night. I looked well ahead at my work, often preventing blunders from being committed; I was a hardworking, happy man, putting by something for old age. But where am I to get piecework now? One establishment has been working short time, another is doing little or nothing, and most of the others don't see the advantages of the piecework system, which can and has been carried to the greatest of success, even in repair shops."

We have often suggested piecework, but the reply is that it cannot be adopted in a repair shop or on promiscuous work. Why not? An average job, even in a small shop, lasts a day; and how much trouble would it be to estimate the value and keep an account (in a small shop) of six jobs a week? Any job done in a shop a second time can be estimated upon for piecework. Sometimes people say: "We do not know what the job is worth." Of course they do not. If a man ties his arm in a sling, he must expect it to grow weak. Just the same with the judgment and perception: men used to piecework can estimate how much there is in a job down to an hour's work in a week; but men who never give the subject a moment's thought cannot. "When I'm too old to work at all," said our friend, "there will be no such thing as daywork, except for laborers."

How to Live Long.

The desire for length of days seems to have been far greater in times past than it is now. With a view of bestowing some timely hints on our active business men, who are rushing on in pursuit of riches regardless of the exhaustion of their physical and mental faculties, our contemporary the New York *Sun* publishes a lengthy article, from which we condense the following:

Nearly all the principal writers on longevity are agreed that human beings may, under the most favorable conditions, live to a hundred, and several have recorded instances of persons reaching a much greater age; but the instances given do not in any case satisfactorily bear rigid examination. Hufeland, public lecturer at Jena, who published a work on longevity in the last century, thus describes the sort of man who has the best prospect of long life: He has a well proportioned stature, without, however, being too tall. He is rather of the middle size, and somewhat thick-set. His complexion is not too florid—at any rate, too much ruddiness in youth is seldom a sign of longevity. Hair approaches rather to the fair than to the black; his skin is strong, but not rough. His head is not too big. He has large veins at the extremities, and his shoulders are rather round than flat; his neck is not too long; his belly does not project, and his hands are large but not too deeply cleft. His foot is rather thick than long, and his legs are firm and round. He has also a broad chest and strong voice, and the faculty of retaining his breath for a long time without difficulty. In general there is complete harmony in all his parts. His senses are good, but not too delicate; his pulse is slow and regular. His appetite is good, and his digestion easy. He has not too much thirst, which is always a sign of rapid self-consumption. His passions never become too violent or destructive. If he gives way to anger, he experiences a glow of warmth without an overflowing of the gall. He likes employment, particularly calm meditation and agreeable speculations—is an optimist, a friend to Nature and domestic felicity—has no thirst after either honors or riches, and banishes all thought of to-morrow. This power of banishing anxiety has an immense deal to do with longevity. It is, in fact, that "management of the mind" which Dr. Johnson so justly told Boswell was "a great art," adding that a man when miserable should not go to his chamber and try to think his trouble down, but should seek every possible means to divert it. Dwelling on misery at once affects, and most seriously, the digestive organs.

There are not a few people the very fineness of whose constitution proves their ruin. They draw so extravagantly upon their powers that they are dust and ashes forty years before the creaky wheels who started in the race with them have done running. In this country we discount our future more heavily, perhaps, than in any other; not by dissipation, but by overtaxing our energies. A very large proportion of men who die rich here die twenty years before they ought if they had properly husbanded their vital resources. Mr. Macy, the well known fancy dealer, was, we believe, only 56 or 58, and had been slaving his whole life; in fact, his complete break-up was explained by his intense toil. Such a career seems like getting very little out of life. A still more striking instance of the kind was that of Mr. Augustus Hemingway, of Boston, who worked himself into a lunatic asylum, whence he came worth some $15,000,000, only to get into his grave a few months later. We doubt whether the history of the world could show a more reckless disregard of life than is shown by commercial men in this country. The science of combining intense application with those habits which conduce to longevity is one that they have not acquired. That it may be acquired cannot be doubted. Newton lived to a great age; and great lawyers have been famous for long life. There seems to be a lack of wisdom in commercial men as to the real value of life. They put a wholly inordinate estimate upon the power of getting and spending.

Rest assured that there is, in brief, only one golden rule to be followed by all who seek longevity—moderation in all things, and management of the mind.

Preparation of Phthalic Acid.

A convenient method for the preparation of phthalic acid for the laboratory is given by Haüssermann in *Dingler's Journal*, page 310. A mixture of one part naphthaline and two parts chlorate of potassium is thrown, small quantities at a time, into five parts of common hydrochloric acid; and the brownish-yellow products, a mixture of addition and substitution products of naphthaline, is thoroughly washed with lukewarm water by decantation. The mass is then dried at a gentle heat to prevent its freezing together, or, as Böttger suggests, it is pressed between white blotting paper,* and then shaken in a flask with petroleum ether (naphtha) to remove the liquid chlorides mixed with it and inclosed within the mass. After filtering and washing with naphtha, and drying the mass, which consists chiefly of tetrachloride of naphthaline, is snow white. It is heated in a sand bath with five or six times its weight of nitric acid, which should not be stronger than 1·35 specific gravity. Several hours are necessary to render the liquid homogeneous. After expelling the excess of nitric acid, it is allowed to cool, when the phthalic acid crystallizes out. The acid is purified by recrystallizing it several times from hot water.

If the nitric acid employed to decompose the tetrachloride of naphthaline is stronger than 1·35, the reaction will go on more rapidly, but an easily perceptible quantity of nitronaphthalic acid is formed, which cannot be easily separated from the phthalic acid.

To convert the phthalic acid into the anhydride, it is only necessary to fuse it and keep it at a temperature of 180° C., or 356° Fah., as long as moisture escapes, although some of the anhydride may sublime off. If the temperature has not exceeded 180° C., the residue will consist of anhydrous phthalic acid pure enough for the manufacture of fluorescine and other compounds. By this method, 30 parts of the anhydride can be obtained from 100 parts of naphthaline. To make it perfectly pure, the acid is boiled with water, and the anhydride purified by sublimation.

For the preparation of phthalic acid on a commercial scale, the method above described is quite expensive, owing to the cost of the materials employed; but for laboratory use and experimental purposes this method is worthy of a trial.

New Weighing Instrument.

The ordinary chemical balance is, of course, rather a costly instrument, it being difficult to make the two halves sufficiently alike, and to combine stability with sensitiveness. M. Pager proposes the following arrangement for small weights. A two-armed tube is filled with mercury, and on one of the mercury surfaces is placed a well fitting plate, which can move in the tube without friction. This serves as the balance scale, and the body to be weighed is placed on it. The liquid will rise in the other arm correspondingly, and equilibrium is at once obtained with great certainty. Place a known weight, 1 grain, for example, and note how high the mercury rises. Then place a second grain and note the additional rise. Going on in this way, a scale may easily be constructed. As for each rise in one arm there is an equal sinking in the other, this scale can be applied to the other leg also, of course in opposite direction. The sensitiveness of the arrangement is considerable. It can be increased by use of the Torricellian vacuum, the plate, with the body to be weighed resting, in this case, on the mercury in the open arm. The scale can here have no fixed zero, since the air pressure varies, which is only a slight inconvenience.

* We suggest the use of infusorial silica to absorb the moisture.—EDS.

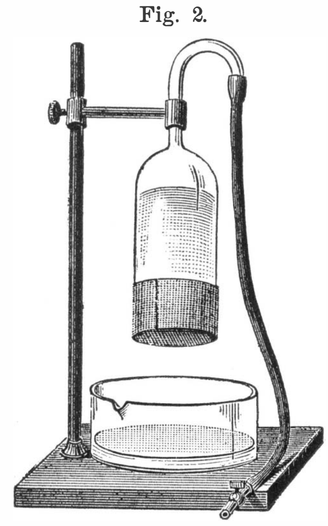
WATER HELD IN A CAGE AND BOILED IN A SIEVE.

If Mr. Romilly has not succeeded in performing the feat of navigating the sea in a sieve, which in the days of witchcraft was supposed to be the chief accomplishment of the professor of the black art, he has done something apparently as wonderful in lifting water in a sieve, holding it in a cage, and afterward boiling it in the former receptacle. Of course there is nothing really marvelous about the performance, when the natural laws which govern it are considered; but as a series of admirable experiments in capillary attraction, it is none the less striking and remarkable.

Mr. Romilly's investigations were undertaken with a view of determining whether a tissue or sieve extended beneath a bell glass filled with water would sustain the water in the glass, the idea being suggested by Mr. Jamin's successful experiments in sustaining water in numerous fine capillary tubes. A bell glass about 8 inches in diameter was closed with a bobbinet having large meshes, each from 0·08 to 0·12 inch square. The glass was then placed mouth downwards in a vessel of water; and by exhausting the air above the water was drawn up into the cylinder to the desired height. The air pipe cock was then closed. On removing the glass, the water was maintained therein, and at each mesh of the tissue appeared a water meniscus, while a large general meniscus formed in the center of the fabric. The height of the water in the glass was immaterial to the success of the experiment. A large tube, 8 inches in diameter, and 6·4 feet long, was closed above with a rubber stopper, through which the aspirating pipe passed. Water, entirely filling the tube, was sustained by the aid of a piece of extremely fine lace fastened over the lower end.

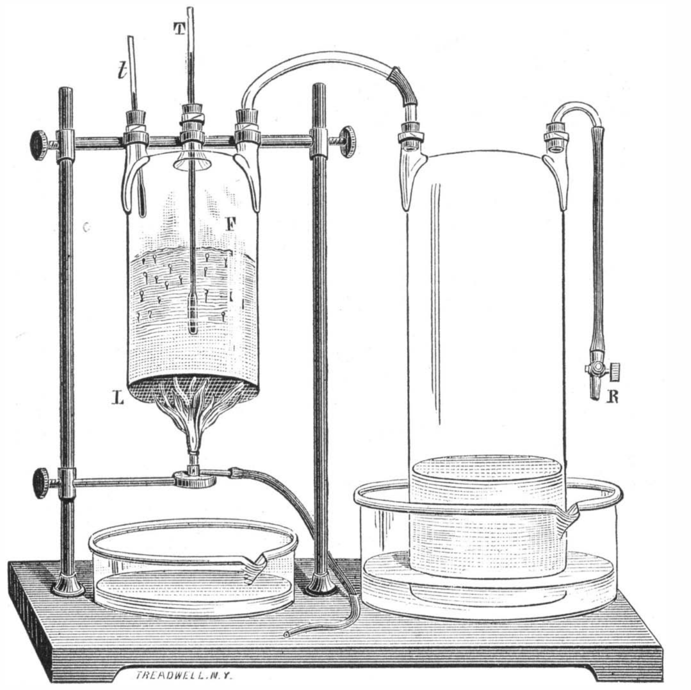
If, instead of securing the tissue over the mouth of the tube or glass, it be held in place by the hand, the water above is still sustained, while the shape of the meniscus below can be changed at will. By gradually lowering the fabric by slowly sliding the hand down the glass, the meniscus is caused to enlarge; and with a bell glass 2·4 inches in diameter, and lace having meshes, 0·8 inch square, the meniscus assumes a curve of from 1·2 to 1·6 inch in depth. This curvature augments with the fineness of the meshes. On this another interesting experiment is based. A square of wire gauze, the edges of which extend beyond the sides of the glass, is held against the mouth of the same by the finger during the aspiration of the water. On lifting the bell glass, the finger is removed, when the gauze remains in place, and the water is sustained as well as if the fabric were permanently fastened. The gauze may be replaced by a ring of metal of the same diameter, over which lace is stretched. When the fabric is perfectly horizontal and fastened in place, if the bell glass is inclined, the water runs out, but the degree of inclination seems to depend upon the size of the meshes. Thus with meshes 0·16 inch square, the least inclination determines the escape of the water; with those 0·04 inch square, an angle of 45° may be safely attained; while with meshes of from 0·02 to 0·03 inch square the following experiment may be accomplished: A glass tube of from 1·2 to 1·6 inches in diameter has, attached to its end by sealing wax, a little hemispherical tea strainer, such as is frequently suspended from teapot spouts to prevent tea leaves entering the cups. In the other end of the tube are a rubber stopper and an aspiratory pipe, as already described. The tube now being filled with water, the latter is maintained by the strainer even if the tube is turned to 45°, or reversed, provided no air bubble is allowed to touch or traverse the metallic gauze. In other words, when the tube is turned with the strainer uppermost, the water is held in the latter as in a cage. The sides of the latter may be from 1·2 to 1·6 inches high with wire gauze of meshes 0·04 inch square; if the meshes are 0·02 inch square, the height may be 2·8 to 3·2 inches.

Fig. 2.



Another curious experiment is illustrated in Fig. 1. A large bell glass is continued downward by a piece of wire gauze 1·2 inches in length and of the same diameter as the glass. The meshes are 0·04 inch square, and the fabric extends across the bottom. If, after having filled the cylinder with water, the horizontal base only is placed on a surface of water, and the air pipe above is opened, the water in the glass will run out. If then, before the level of the escaping water has passed the bottom of the glass, the aspiration pump be started, the water will remount in the glass, and not a single air bubble will enter through the side of the wire gauze addition, although that portion is wholly exposed. And further, the water level may be allowed to descend half the height of the gauze addition; and yet, when the pump is set in motion, no air will be drawn through the wire gauze, a thin pellicle of liquid seemingly cutting off access of the atmosphere, while the water rises in the glass as before. With wire gauze, having meshes from 0·02 to 0·03 inch square, this effect is augmented, and the water level may be allowed to fall 1·6 inches below the bottom edge of the bell glass.

The temperature of the meniscus formed does not influence its resistance. A bell glass, covered below with gauze which sustained the water, was placed over a gas burner. The flame spread over the watery surface, and the water boiled without falling. An almost invisible gauze suffices for this experiment, and it may be either affixed to the glass or attached to a metallic ring and simply applied, as already described. When ebullition becomes violent, the water falls; but by regulating the flame by the indications of a thermometer in the bell glass, lowering the heat when 212° is exceeded, the experiment may be indefinitely continued. In order to insure success, however, it is better to connect the bell glass in which the water is to be boiled with another plunged in a vessel of water. The two glasses are connected so that the water is drawn by aspiration into each simultaneously. The dilatation of the heated air then distributes its effect over both glasses and the water does not fall. The water is likely to fall little by little, with a single glass, as steam is raised. Fig. 2 shows the disposition of apparatus for the above experiment. The bell glass, F, has three necks, and is 6 inches in diameter. T is one thermometer, for denoting the temperature of the water, and *t* is another, for showing that of the air. The gauze is held in place beneath F by a simple rubber band.

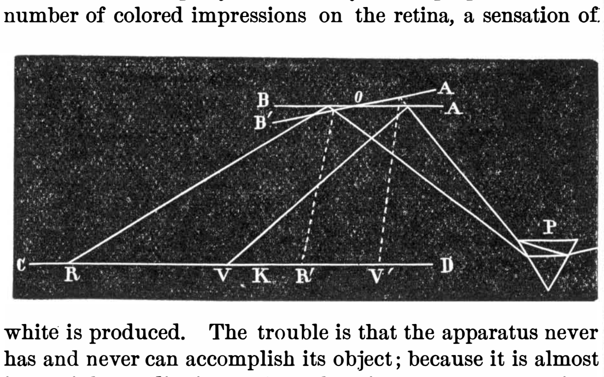


ROMILLY'S EXPERIMENTS IN CAPILLARITY.—Fig. 1.

Neither before nor during ebullition do the meniscus bubbles become displaced, to rise to the surface. As it is necessary to replace the water in the glass which may be evaporated during the boiling, this may be done in a curious way, in keeping with the odd nature of the entire series of experiments. As soon as ebullition is well established, and the water level has somewhat fallen, a curved pipette is filled with cold water, which is ejected therefrom in a jet against the gauze. The jet penetrates the gauze and the level is quickly re-established.

A NEW EXPERIMENT FOR THE SYNTHESIS OF SUNLIGHT.

M. Laraut de Lestrade has recently exhibited before the Scientific Congress of Clermont-Ferrand, France, a very beautiful and simple experiment for recomposing sunlight from the spectrum. This experiment is now very imperfectly done by Newton's disk, which is painted with segments of different colors, proportional in extent to the area occupied by the colors respectively of the spectrum; and this is rotated rapidly, so that, by the superposition of a number of colored impressions on the retina, a sensation of



white is produced. The trouble is that the apparatus never has and never can accomplish its object; because it is almost impossible to distribute the colors in accurate proportion, and because no pigments ever can approach the spectrum colors in brilliancy and purity, and hence, when combined, can never produce white, but only a dull indefinable gray. M. de Lestrade retains the idea of superposing the prismatic hues in the retina, but he uses the split-up sunbeam itself and not painted representations. P in the annexed diagram is the resolving prism, and the spectrum is received on a rectangular mirror, A B, located eight or ten feet distant. The spectrum is therefore reflected upon the screen, C D, say from R to V. Now suppose the mirror to be slightly turned on a vertical axis to A' B'; then the reflected spectrum will be moved along to R' V', and any point, K, on its path must therefore be traversed by all the spectral colors in succession. Rotate the mirror rapidly, and the rapidity of colored impressions, produced on the eye gazing at K, will produce the sensation of white light. Two mirrors, placed back to back, are of course better than a single mirror in causing the quick displacement of the colors.

One advantage of this admirable experiment—which is, without exception, one of the most ingenious that have ever come under our notice—is that it may be employed for the study of the combinations of the various prismatic colors. For this purpose, a metal screen having a rectangular aperture large enough for the passage of the whole spectrum is suspended a short distance in front of the mirror. Small movable screens of various dimensions are hung before the opening so as to intercept such colored parts of the spectrum as are desired to be stopped out. Then, by turning the mirror, a mixture of colors is obtained very easily, and without reference to their relative proportions in the spectrum.

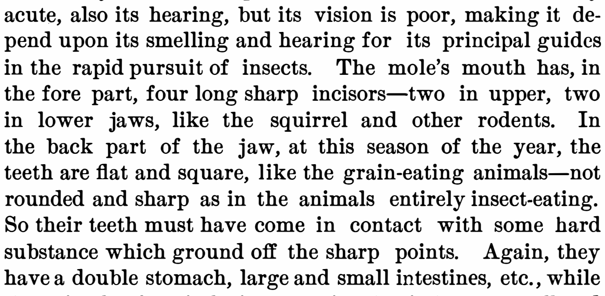
Moles.

A correspondent of the Ohio *Cultivator* says: "There are two kinds of moles in this country—English and American. The English mole is rather small, with short, thick, blue fur; its feet are large, broad, and powerful, used in burrowing; its nose is also very strong, for the same purpose. It runs in burrows, underground generally. I have seen it, when plowed up in corn fields, burrow under the loose soil rapidly, simply by the use of its nose, going, even in hard ground, faster than a dog can follow by digging. I suppose this mole hibernates in extreme cold weather, as I have not noticed it during the colder part of this last winter. I think for this reason that its food must be chiefly worms and insects, as these are all gone in cold weather.

"The other mole is about as large as a half-grown rat. Its fur is grayish brown on the outside, but blue close to the skin. Its feet are not so large or powerful as those of the English mole, and its runs are mostly on the surface of the ground, under grass, weeds, or rubbish. Its nostrils are extended beyond all other parts of the nose. Its smell is very acute, also its hearing, but its vision is poor, making it depend upon its smelling and hearing for its principal guides in the rapid pursuit of insects. The mole's mouth has, in the fore part, four long sharp incisors—two in upper, two in lower jaws, like the squirrel and other rodents. In the back part of the jaw, at this season of the year, the teeth are flat and square, like the grain-eating animals—not rounded and sharp as in the animals entirely insect-eating. So their teeth must have come in contact with some hard substance which ground off the sharp points. Again, they have a double stomach, large and small intestines, etc., while the animals of entirely insect-eating habit have a small and simple stomach, and scarcely any intestines save the œsophagus and pylorus."

IMPROVED FISH SCALER.

The annexed engraving represents a convenient hand implement for removing scales from fish, and for scraping them after the scales are loosened.



A thin metal blade has one edge provided with teeth which are similar to saw teeth, while its opposite edge is plain. This blade is bent to a semicircular form, and its ends are secured to the opposite ends of the head or block, A, this forming a scraping tool which can be very conveniently handled. To the opposite end of the handle is secured one end of a cord, to which is attached a long pointed rod or spear, B.

In cleaning a fish the spear is forced through the tail and the point pressed into the table underneath. The operator then loosens the scales of the fish with the toothed edge of the blade by drawing the implement over the body of the fish from the tail to the head. When the scales are loosened, the implement is turned over and the fish scraped with the plain edge.

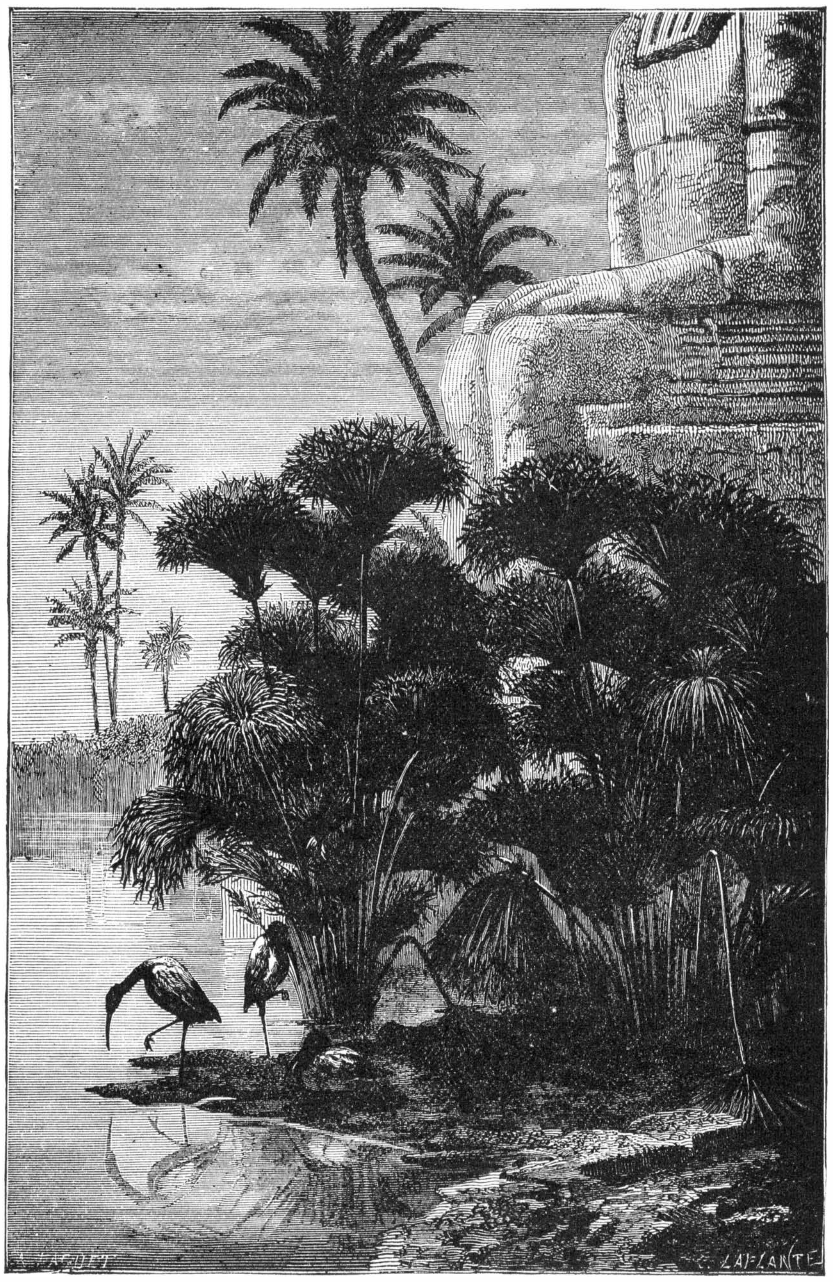
Patented February 22, 1876, by Mrs. Sarah Lawton, of San Francisco, Cal.

THE PAPYRUS OR PAPER REED.

The papyrus plant or paper reed, an engraving of which (taken from Knight's *New Mechanical Dictionary**) is herewith presented, belongs to the family of *cyperaceæ* or sedges, nearly related to the grasses, and as remarkable for the small number of its useful plants as the grasses are for their many valuable species. It was called *papu* by the Egyptians, whence the Greek *papuros*, the Latin *papyrus*, and our word *paper*. It grows on the marshy banks of rivers in Abyssinia, Syria, and Sicily, and formerly abounded on the banks of the Nile; but at present it has nearly disappeared from Egypt. The plant has large and abundant root stocks, which spread in the mud and throw up numerous stems from five to ten feet in height, the lower portion being submerged; the stem is triangular and smooth. The leaves all spring from near the base, the upper part of the stem being quite naked and bearing its inflorescence at the apex in the form of a large compound umbel. This consists of numerous slender branching peduncles, bearing at their extremities the flowers in small heads or spikes, and forming a graceful, drooping tuft, which has at its base numerous long narrow leaves.

In making paper, the inner cuticle of the stalk was separated into thin *laminæ* by a sharp point. The finest were those next the pith; and the layers, of which there were about twenty, decreased in quality as they approached the outer integument, which was coarse and fit only for making cordage, mats, etc. The slips were laid side by side on a smooth flat surface, and covered with a second layer placed at right angles to them, after which they were pressed so as to cause the different *laminæ* to adhere to each other and form a single sheet, which was then dried in the sun. It is said that the layers were made adhesive by wetting them with Nile water, to which Pliny ascribes a glutinous quality. The sheets were finally beaten smooth with a mallet and polished with a piece of ivory. When finished, the papyrus was rolled upon a wooden cylinder, the ends of which, projecting beyond the edges of the sheet, were neatly finished and ornamented.

The papyrus plant was used for a great variety of purposes besides paper. Its graceful plumes crowned the statues of the gods, and decorated their temples: its pith was eaten as food: wickerwork boats, boxes, and baskets were woven of its stalk; and of its bark were made sails, cordage, cloth, mats, and sandals for the priests. It was applied as medicine to the cure of fistulas and ulcers; it furnished material for torches and candles, and its roots were used for fuel and manufactured into furniture and household utensils.



THE PAPYRUS.

Fireproof Walls.

The report of a committee of the National Board of Underwriters, giving the palm to the fireproof quality of brick as a material for buildings, is strikingly confirmed by our own experience. The walls of the *Journal of Commerce* building, though exposed in the upper parts to an extremely intense heat for nearly two hours, prove to be but slightly injured. A few trifling cracks, readily repaired, near the roof, are the only signs in the walls of the ordeal through which they have passed. The walls were strongly constructed, intended to last, and they have served their purpose. Had the structure been made of granite or marble or iron we can guess what would be its present condition from the fate that has overtaken so many buildings composed of those materials. The report of the Fire Underwriters' Committee makes no new points; but it presents again in a very convincing manner some of the evidences, which ought to be heeded, as to the superiority of brick over stone or iron for building purposes. One of the most impressive proofs given is that offered by the great fire in Boston in 1872, when the rear brick wall of the new Post Office Building in that city was exposed to a terrible direct heat for hours without sustaining a crack or blemish of any kind; whereas the granite side of the structure, not facing the fire, was seriously damaged, and it was necessary to take down portions of it The report strongly condemns the use of iron in architecture, declaring it "undesirable for such purposes, and unsafe in a fire point of view." The recent destruction of large iron edifices in New York and St. Louis is cited as testimony on this head. The wreck of the iron building burned in Bond street of this city last winter was a quick piece of work; but St. Louis beat it at a fire last month, when one of the largest iron structures in that city lay flat on the ground within twenty minutes after the fire was discovered in it. The committee say that wooden columns, pillars, or supports of proper dimensions will stand fire better than iron. They recommend, for fireproof doors or shutters, wood clad with sheet iron or tin. These are all practical suggestions worthy to be heeded by architects and owners of buildings. And they will have almost the force of law in the community if they are made the basis of discrimination in insurance rates adopted by the companies.—*New York Journal of Commerce.*

* Published in numbers by Messrs. Hurd & Houghton, New York city.

The American Inventor.

The British *Trade Journal* says: "The ingenuity of the American inventor is a curiosity in itself. Having exhausted the credulity of the customers for wooden nutmegs, and the ligneous ham having proved a failure, the New Englander has lately been devoting his sharp intellect to inventions nearly as profitable and rather more reputable. A few years ago soft felt hats were extensively worn in the United States. They were very pleasant, but had the one fault of getting limp and slouchingly unsightly in the brim. It struck a keen New Yorker that a bit of galvanized wire run around the brim would not only obviate this, but give the beaver the desired cock at will. No sooner thought of than done, and no sooner done than patented. Luckily a patent does not cost quite so much in the United States as here, and the lucky inventor is said to have netted a fortune. Now we hear that the genius who first brought out wooden toothpicks has made $50,000 by his little manufacture. At first, if the universal traveler's tale be true, a fork, or the all-useful bowie knife, served this purpose. But, as the country advanced in luxury, the demand for a weapon more civilized and a little lighter became universal. Found the demand, the man who was to satisfy it soon appeared. At first the toothpicks were made of hard, fibrous wood. But this, we are told by New York journals, did not serve. The hickory toothpicks lasted too long. Latterly he has been making them of soft pine wood, and with a great increase to his gains, for it now takes four sound picks to get the broken end of one out from between the teeth. This almost equals the genius who, finding no sale for his cargo of shoe pegs in Philadelphia, 'whittled the other end, and sold them for oats in New Orleans.' At least, so we read in an American newspaper, and all the world knows how jealously they cling to the truth."

Action of Sea Water on Lead.

The *Journal of the Chemical Society* says that, after keeping strips of new cut lead in a bottle of sea water, frequently shaken, for four days, no trace of lead could be detected in the water, but the bright surface of the strips was coated with an insoluble lead compound. Hence, lead pipes may be used in marine aquaria without any fear of injury to their inhabitants.

Gardening all the Year Round.

Under this heading, D. H. Jacques, Esq., contributes to the *Semi-Tropical Magazine* some timely hints to agriculturists, from which we make the following extracts:

Watering so as to merely wet the surface of the ground often does more harm than good. The roots of the plants are thereby attracted to the surface, thus temporarily moistened; but as it soon becomes as dry as before, and harder than ever, the young roots perish in the intervals of watering, and the plant is weakened rather than strengthened, and not infrequently killed outright. The ground should be well soaked and the watering not frequent. In the case of trees, shrubs, and large herbaceous plants, it is well to draw away the surface earth from them to the depth of two or three inches, doing it carefully, so as not to injure the roots, apply the water, and then return the dry soil. This prevents immediate evaporation and gives the roots the full benefit of the water, without exposing them to be burned up by the hot sun. Where this is not practicable, as among small plants, holes may be made near them with a dibble or sharpened stick, and water poured into them from the nozzle of a watering pot. The plants may afterward be slightly sprinkled from the nose of the pot and the ground stirred with the prongoe.

Saltpeter, a tablespoonful or more to a bucket of water, is an excellent occasional application to most kinds of garden plants, being at the same time a fertilizer and an insect destroyer. Many grubs and bugs may be destroyed by copious waterings with this solution.

To keep plants bearing: The production of seed is an exhaustive process, and, as a rule, its completion is signalized either by the death of the plant, if an annual, or by a temporary suspension of the process of growth, if a biennial or a perennial. The immediate end for which Nature has sustained it has been attained. If we are cultivating it for seed, our object is the same, and we should not interfere with Nature's processes; but if, as in the case of the okra, the cucumber, and the summer squash, we make use of the immature fruit and desire to increase and prolong its production, we must carefully cut off, before maturity, all that is produced, whether we can make use of them or not, so as to encourage an abnormal production. Also, where a root or a bulb is the object of cultivation, as in the Irish potato or the onion, we should remove the flower stems. If seeds are desired, certain plants should be set apart for their production and the earliest and best fruit be allowed to ripen. The same rule applies to the flower garden. If we desire continued bloom, the plants must not be allowed to mature seeds.

Moss for potted plants: It is beneficial, at this season, to cover the earth around plants in pots and baskets with a layer of fresh moss, to be changed as it becomes dry and dead. It keeps the moisture from evaporating, secures a greater uniformity of temperature, and improves the looks of the plant.

Transplanting: Tomatoes, peppers, and egg plants should be transplanted, as required to keep up a succession of fruit, choosing showery weather for the operation, or watering and shading as heretofore directed. In light, porous soils, transplanting becomes a work of some delicacy and difficulty, as the summer advances, especially when the rains are light and infrequent, as is often the case at this season. See previous hints on this subject.

Flower garden work: In the flower garden the operations of the month are mainly the same as in the vegetable garden. Stir the soil, kill all weeds, transplant, shade, and water. Liquid manure is here fully as effective as in the kitchen garden, giving wonderful size and brilliancy to the flowers. Rose and other bushes will be much benefited by a top dressing of pulverized charcoal and ashes composted with rotten muck or surface soil from the woods.

The Great Eastern to be a Meat Ship.

The owners of the Great Eastern are, it is said, considering the propriety of converting that magnificent vessel into a huge refrigerating chamber for the conveyance of American meat. A recent examination has disclosed the fact that, like the Great Britain—another of Brunel's ships—the hull is practically in as good condition as when first built, and the directors consider it would be wise to raise sufficient money to put new and improved engines and boilers into the vessel. They have been empowered to prepare a rough estimate of the cost of the new machinery; and in view of the fact that the vessel can even now steam as fast as any of the Atlantic liners, the trade in meat, which is being developed not only with the United States, but also with Brazil, promises to open a wide field of usefulness—a trade in which the great vessel need never carry only half a load.

Communications.

Our Washington Correspondence.

To the Editor of the Scientific American:

Business in the Patent Office still continues brisk, and a larger number of patents than usual are being issued—the average weekly list for the last three weeks being 352, including all issues.

The competitive examination for the vacant position on the Board of Appeals resulted in the names of Messrs. Bates, Wilbur, and Catlin (as the three best on the list) being reported by the Examining Board to the Secretary of the Interior, who nominated the first named gentleman to the President for appointment; and he was accordingly appointed to the position. Mr. Bates being Examiner of Interferences, it became necessary to appoint some one to fill his place; and Mr. Wilbur, as second on the above list, was appointed to this position. This creates a vacancy in the primary examining corps; and now there is to be another examination to fill the place made vacant by Mr. Wilbur's promotion, which will probably take place ere this is published.

The Coast Survey Office is now fitting out two parties to survey the coast of Maine: the first party under Lieutenant Moser, U.S.N., on the steamer Endeavor, and the other under Lieutenant Hawley, on the schooner Ernest. A third party is being fitted out for the purpose of making off-shore tidal current observations in the same locality, under Acting Master Robert Platt, on the schooner Drift.

The question how to survey, economically, the occasional spots of arable land which dot the sterile deserts in the far West has engrossed the attention of the Land Office for several years. The practice has been to extend one of the main base lines and one of the principal meridian lines until they intersect in the vicinity of the spot to be surveyed, and from this point continue the survey by laying out townships, sections, etc. This often involves running lines through desert lands, for hundreds of miles, at great expense; to save which Lieutenant Powell, the explorer, now proposes to arrive at the initial point for this kind of lands by triangulation, which can be done at much less expense and with equal precision. It is thought, however, that the law as it now stands will not allow of this being done; and it is probable that the subject will be submitted to Congress at the next session for consideration, and the necessary change in the law.

Many agents of the different European governments are reported as scattered over the country, engaged in buying up all the white oak timber in the market ready for shipment. The French Government has recently made large purchases in Norfolk and other Southern ports; the English agents are busily negotiating for all they can find in New York, Philadelphia, and Baltimore; and Russian agents are securing all they can find wherever it is to be purchased. Ex-Secretary Robeson was very much blamed by the opposition press for making large purchases of this material during his official term; but now the different foreign agents are willing to pay the government double what he gave for it.

There is now being erected in the Mineral Hall of the Smithsonian Institute some remarkable specimens of the plastic art. One of these is a copy in terra cotta of the group "America" upon one of the pediments of the Albert Memorial in London. The figures are of heroic size, and are probably the largest ever made in this material. There is also a pulpit, with the steps leading thereto in red and white terra cotta, relieved by gilding; and two fonts of the same material. The sides of the pulpit are ornamented with scenes representing the life of the Saviour, and the fonts with scenes connected with children from the Scriptures.

Washington, D. C. OCCASIONAL.

A New Remedy for the Potato Bug.

To the Editor of the Scientific American:

In the spring and summer of 1875, in experimenting with the Colorado potato bug and the action of certain chemicals on the bug and its eggs, I discovered that a solution of the sulpho-carbonate of potassium in water had the property of dissolving the skin or covering of the eggs. When this solution was applied to the potato plants on which there were eggs, that part of the leaf on which the eggs were would be turned brown and dead, and the eggs (which are generally on the under side of the leaves) would be dissolved and run into a pasty mass which soon dried up.

It is not necessary for the solution to come in direct contact with the eggs; for when it was applied to the upper part of the leaves, the eggs on the under side would be dissolved as effectually, though not quite as fast, as when the solution was applied directly on them.

I do not remember having seen any notice of this action of the sulpho-carbonate of potassium on the eggs of insects; and it occurred to me when I read the article in the SCIENTIFIC AMERICAN of April 28, page 261, by Professor C. V. Riley, on the grasshopper, that this salt might prove as effectual a remedy for the grasshopper, by destroying its eggs while they are in the ground, as it has proved for the phylloxera in France. In the SCIENTIFIC AMERICAN SUPPLEMENT, No. 34, page 536, there is a copy of an article, read before the French Academy of Sciences by M. Joubert, on the sulpho-carbonates as a remedy for the phylloxera. He gives 145 grains per square yard of surface as the amount to be applied for this insect. These proportions would not do to apply for the grasshopper, as it would cost more than the land is worth in many cases. If the sulpho-carbonate of potassium has the same effect on the eggs of the grasshopper as it has on the eggs of the potato bug, it would certainly be well worth trying.

I hope some one who may have the opportunity of trying this remedy will do so and report the result. The sulphocarbonate which I used is known in the market as the sulphide of potassium.

Philadelphia, Pa. WM. L. BILLIN.

Steam Cars vs. Horses.

To the Editor of the Scientific American:

An experiment was made in Philadelphia, a few days ago, to show the possibility of superseding horses by steam on their railways. The seven cars used in this trial present nothing different in their general plan from that of the most successful ones which have been many times tried and are now in use in some other localities, except perhaps the application of steam to the brakes for sudden stops.

Steam seems destined to complete its mission to man through the media of piston and crank. These simple devices will probably never be superseded as a means of transmitting the force of steam to a driving wheel. The only thing now to be done is to give to the steam car the best material, the best proportion, the best of workmanship, and a level track to work upon, and its complete success will be assured. No grade should exceed twenty feet per mile; it is far better to go three or four miles round than to go half a mile over a hill at a much steeper grade than this. Six of the cars are inside-connected, and have 5½ inch pistons and 7 inch cranks; the other is outside-connected, and has 8 inch pistons and 5 inch cranks. This last is far the best arrangement for hard work. Less area of pistons and longer cranks would be preferable, however, and 5½ inch pistons and 10 inch cranks would be quite as efficient and would impose far less strain upon the bearings, and hence would be more durable. The bodies of the cars are about twenty feet long, five feet of which, at one end, is used for the boiler and engineer, the machinery being placed horizontally under the floor. Now that we have excellent steel plate for boilers, and have learnt to exactly match the rivet holes by drilling, and to rivet by machinery, there can be no reason why a steam car should not be made, with all of our improved appliances and experience, to run twenty years at an expense for repairs of less than twenty dollars a year.

The most formidable bars to the success of steam cars are steep grades. It requires only about 8 lbs. to draw a ton on level rails, while the ascent of a 20 feet grade requires about double this amount; and the ascent of a 160 feet grade, like that upon the Worcester and Shrewsbury road, requires about nine times this amount. To figure this out, we have only to divide the number of feet in a mile by the number of feet rise per mile, and then divide the number of lbs. in a ton by the quotient. The last quotient, *plus* 8, denotes the number of lbs. required to draw a ton up the grade. Thus: $\frac{5280}{160} = 33$, then $\frac{2000}{33} = 60$, then $60 + 8 = 68$ lbs. to draw a ton up a 100 feet grade.

Worcester, Mass. F. G. WOODWARD.

The Russian and Turkish Navies.

The present war between Russia and Turkey is likely to bring about the one event which is needed crucially to test the efficacy of modern armored vessels, that is, their opposition in actual combat. All the building of ironclads, and the constant improvements in their armor due to the increase in power of heavy guns, which have been going on for the past fifteen years, fairly may be regarded as accomplished under conditions embodying a constant element of uncertainty; and this for the reason that the always varying circumstances under which vessels may enter into conflict cannot be foreseen or provided for. Leaving out of consideration the skirmishes which occurred on the coast of Spain during the civil war in that country, none of the European ironclads have ever (with the exception of a single instance) been in action. This exception was the quickly decided fight between the Austrians and Italians, in which twelve Italian armored vessels and eight wooden vessels met the seven armored and fifteen wooden vessels constituting the Austrian fleet. The Italian flagship Ré d'Italia, a wooden ironclad, was rammed and sunk by the Austrian flagship Ferdinand Max; and the Italian corvette Palestro was blown up. The Italians exhibited extraordinarily bad gunnery, and the Austrians won an easy victory. This battle, however, furnishes no useful lesson, unless it is to show how difficult it is to manœuvre a ship so as to render her ram effective against an enemy who manœuvres equally well to get out of the way; for the Austrian could not ram the Ré d'Italia until the latter had had her rudder disabled. The conflict mainly, however, is an instance in point, exemplifying the fact that the conditions determining success in battle are not to be gained by providing a preponderance of ironclads in one opposing fleet; nor can the fortunes or misfortunes of vessels be invariably provided for by the skill of the naval constructor.

The two fleets which are soon to serve as targets for each other, and thus, at the cost of much blood and money, to furnish data of inestimable value to the war-shipbuilder of the future, are quite evenly matched, as far as ironclads are concerned. Russia has 29 armored ships, and 196 other vessels of all classes, carrying altogether 521 guns; 27 of the first mentioned vessels are in the Baltic, and 2 are in the Black Sea. Of these, the recent report of Chief Engineer J. W. King, U.S.N., on European ships of war, whence we take our facts, says that but two, the Peter the Great and the Minin, approach the modern standard of fighting efficiency. The Peter the Great's armor is 14 inches in thickness, with iron hollow stringers on the backing besides, which are alleged to give an additional resistance equal to 2 inches of iron. The four guns, two in each of the turrets, are steel breech-loading guns on the Broadwell system, of 12 inches caliber. She has no ram. Her length is 321 feet, breadth 64 feet; displacement 9,510 tons. She has twin screws, and a maximum speed of 13 knots. The Minin is 298 feet long and 49 feet broad, and displaces 5,650 tons. She carries four 11 inch guns, and 12 inches of armor on 24 inch backing. She is a rigged turret ship on the Coles system, but is undergoing alterations which will place her guns on two turntables on the main deck, so that they fire *en barbette* over the top of the battery. Next in importance are the broadside vessels Duke of Edinburgh and General Admiral. These are of iron, wood-sheathed, and displace 4,438 tons each. Their armor is disposed in a belt over the vital parts, and is 6 inches thick by 7 feet wide. Their speed is 13 knots, and armament four 8 inch rifled and two 6 inch chase guns. Next in the sea-going fleet are four ships named after admirals, two carrying each six guns in three turrets, and two each four guns in two turrets. The caliber of the guns is but 9 inches, and the armor but 6 inches thick. Two wooden armored frigates follow, which carry large batteries of small guns and thin armor. They may be regarded as obsolete. For coast defence, Russia has the circular ironclads which we have so frequently referred to, but the efficacy of which is, to say the least, doubtful. One has two 11 inch, the other two 12 inch, guns; and the thickness of armor is respectively 11 and 18 inches. There are ten single turret monitors of the early Ericsson pattern, and the three two-turret monitors carrying 10, 8, and 9 inch guns, and having armor not exceeding 5 inches.

As against this fleet Turkey can make the following exhibit: The Mesoodiyeh and Memdoohiyeh have recently been completed in England. The first has already been delivered to the Sultan, the second completed her trial trips in January last. The displacement of these ships is 9,000 tons each, length 332 feet, and beam 59 feet. They are full-rigged frigates of the broadside central battery type, with hulls of the usual cellular construction, there being in all 82 water-tight compartments. The battery is 153 feet in length, and the armor plating on the sides is 12 inches thick, backed by the same thickness of East Indian teak. The armaments are twelve 18 ton and two 6½ ton Armstrong guns. The maximum speed is 13·8 knots. Five ironclads follow, each nearly 300 feet in length and carrying 10 inches (in one case 9 inches) of armor plating. The armament of four is fifteen 6½ ton guns and one 12 ton gun; the fifth has ten 12½ ton, two 6½ ton, and 6 small, guns. Seven ordinary station service ships follow, four with armor ranging from 9 to 7 inches in thickness, and carrying each four 12 ton guns, three with armor from 4½ to 4 inches carry five 150 pounders and one 12 ton gun. Lastly come five gunboats, each carrying two 12 ton guns and 3 inches of armor, and two coast defence monitors. In all, Turkey has 24 armored fighting ships, nearly all new. She has few wooden seagoing cruisers, and therefore it is probable that no naval combats will occur elsewhere than in the vicinity of the immediate seat of war, and most likely in the Black Sea.

The Fall of the New York Post Office Roof.

The falling of a portion of the roof of the Post Office Building in this city recently killed three men, and wounded several others who were at work in a room beneath. The Acting Supervising Architect, Mr. James G. Hill, says that the roof was from 50 to 75 per cent heavier than it should have been. It carried five inches of concrete and cement at the crown of the arches, and a thickness of fourteen inches of the same materials at the deepest part, over the nine inch rolled beams. Some time ago, a portion of a brick wall, which aided in supporting the weight of the roof, was removed, and in lieu thereof a Howe truss girder was substituted. This gave way, and appears to have slipped from its inner bearing on the interior wall, and also to have brought down the plate and purlin by which the outer end was sustained. The purlin seems to be badly wrenched; but as yet it is not definitely determined where the structure first failed.

It is generally conceded that the Post Office Building, though imposing in general appearance, is of inferior architectural merit; but it has always been supposed that, as an edifice, it was exceptionally solid and strong. The Coroner has impaneled a jury of prominent architects, and the thorough investigation which the structure will receive at their hands will doubtless bring out the true facts in regard to it.

A VERY general reduction of wages is in progress among the miners and blast furnacemen of Scotland. In a number of instances the men are already working on the reduction, and in a week or two the notices will take effect at other works. As a rule, the reduction amounts to 6d. per day, which brings down the wages to a very low level. In one district it is said that the wages, even for six days' work, will not exceed $4.50, gold, per week, when the offtakes are deducted from the gross earnings.—*Engineering.*

THE address of Mr. H. R. Houghton, whose fire escape we illustrated in our last issue, is 59 West 42d street, New York city.

HOW TO DO IT, AND HOW NOT TO DO IT.

In walking through a workshop the eye of the ordinary observer will almost invariably lead him to form a tolerably accurate estimate of the capabilities of at least a large proportion of the workmen; and especially is this the case in a large shop, where the men can scarcely be so carefully selected as in small establishments, when their numbers are comparatively limited. There is something in the attitude, the interest taken in his work, the energy or delicacy, as the case may be, with which the expert workman handles his tools, which points him out as plainly as the awkwardness, indifference, or abstraction indicates his opposite; and what that something is the pen of our artist has delineated far more plainly than words can express. Take, for example, the figure represented in "How to Do It" in the act of rough chipping, and it is observable at a glance that his mind as well as his muscle are concentrated upon his work. We are very apt to cast a pleasant glamour upon the past; and this it is which causes each successive generation to look back, perhaps with regret, to the good old times; and to those who highly value mechanical skill, the days of the hammer and chisel were good old times indeed. The workman of the special machine workshop of these days would be altogether surprised to see the large amount of good and accurate work which expert old mechanics can perform with the hammer, chisel, and file. There are, indeed, workmen still extant who would have no hesitation in undertaking to equal in quality and surpass in quantity, upon some kinds of work, the capabilities of the ordinary vise hand even with the assistance of a modern planer and shaper. Among this class of work the fitting in of brasses into ordinary pillow blocks may be instanced. And although, as we have said, the hand workman of the good old times is not altogether extinct, he is not to be found in special machine shops, and may be looked for in repair shops, where he commands nearly one third more than the average machinist's wages.

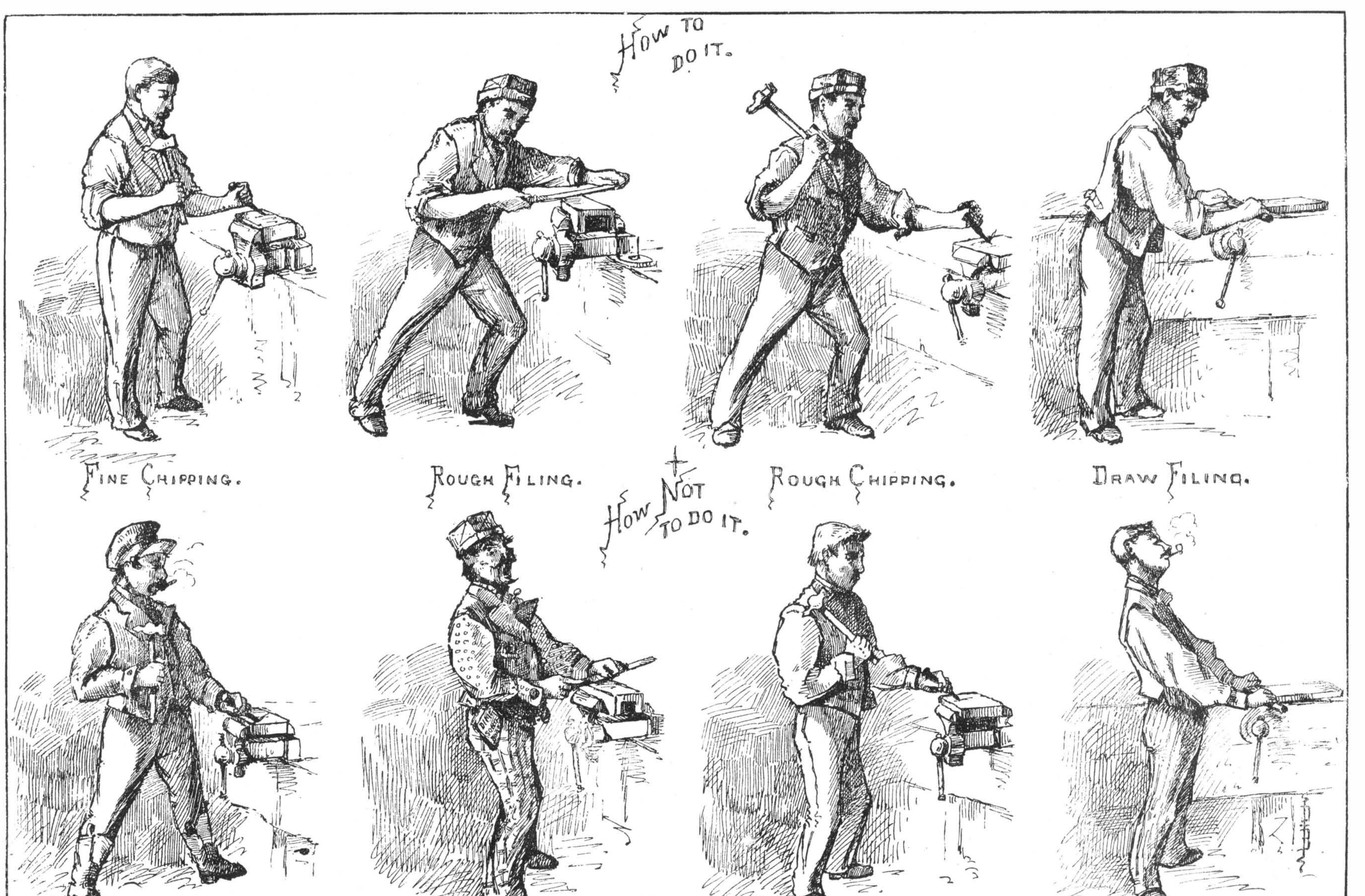
In the illustration under the heading of "How Not to Do It," our artist has represented not only errors in the method of manipulation, but also the want of interest in the work which is at times met with in large shops among the operatives; while in "How to Do It," he has shown the proper attitude for the workman performing the several operations, and has given him, in each, the look of a zealous and painstaking artisan.

The chipping hammer is not by any means the rude instrument which it appears to the uninitiated; and there are as many styles of using it as there are in the use of the pen. For heavy duty, it should be held near the end of the handle. The arm should swing freely, the hand never traveling further backwards than a line vertical to the operator's shoulder. The movement should be obtained partly from the elbow, partly from the shoulder, partly from the body itself, and (in a minor degree) from the wrist. If then we turn to the figure "Rough Chipping," in "How Not to Do It," we perceive that, with the hammer held as there shown, these movements would be difficult, and would cause a constrained action of the body and arm. The chisel should be held close to its head, gripped tight, and pressed firmly against its cut.

For fine chipping—that is to say, for the finishing cut—the chisel is held in the same manner; the hammer is grasped nearer to the middle of the handle, and the blows are comparatively light. Under such circumstances, the cut may be so smoothly taken that the finger applied over a length of, say, two inches, without the assistance of the eye, will fail to detect if the work has been chipped or filed. Both these operations require strict attention; and though apparently rude, they are actually delicate if skillfully performed.

In contrasting the two illustrations of rough filing, the practised eye would readily detect the improper manipulation, irrespective of the want of attention, shown in the one figure. The distance of the operator from his work would alone expose his unskillfulness. To properly use a rough file, it should be held so that the file handle presses against the palm of the hand, and hence so that the strain due to pushing the file will be in a line with the length of the arm from the hand to the elbow. The operator should stand well off from the vise, and must drive the file by a motion of the body almost as great as that of the arms. In this way, the weight of the body will be placed upon the file to such an extent that the heel of the operator's forward foot will lift from the floor, as shown in our illustration, the fulcrum for the pushing duty being the rear foot. During the return stroke of the file, the forward or left foot comes into play as a fulcrum, by which the operator's body recovers its former position; and it also enables the arms to relieve the file of pressure during its back stroke. The motion of the file during this latter stroke should be much quicker than during the forward motion. The file is a wonderful tool in skillful hands, capable, indeed, of producing work more truly smooth and accurate than any other known cutting tool, the lathe tool not excepted. Its use, indeed, in the finishing processes is mainly to correct the inaccuracies which are inherent to work produced by other cutting tools, especially upon plane surfaces; and it is an inexorable fact that we have at this day no machine or tool capable of producing flat metal surfaces as small, even as six inches square, so true that a judicious application of the file will not at least double the contacting area of two such pieces placed together.

Draw filing is a method of using the file which answers two purposes: the first to leave the file marks in the most desirable direction, and the second to touch only such parts of the work as require operating upon to secure truth and accuracy of dimensions. Having rough and smooth crossfiled the work down to such a size that the drawfiling will entirely erase the crossfile marks (for filing in the position shown under the heading of rough filing is called crossfiling, whether the file be a rough, second cut, or smooth file), the operator tests his work to discover the protruding spots or places. He then casts his eye along the length of the file, holding the latter edgeways to the eye, first to ascertain the curve or sweep of the face of the file, and secondly, to select a part of the file where that curve is the greatest and most regular. Then turning the file over, he brings the selected part of the file to bear upon the protruding part of the work, and uses the file as shown in our illustration, watching intently every mark made by the file teeth, so as to insure that the cutting duty is being performed exactly in the required spot, and that the surrounding surface is not being operated upon. If the surface of the work has been drawfiled all over, and it becomes difficult to distinguish the file marks being made, he gives the file a slight lateral movement (first to one side and then to the other) as well as a reciprocating one, so that the new file marks distinguish themselves by slightly crossing the old ones. It is in drawfiling that the utmost skill is to be shown; and here we may caution the operator against an error that he is very apt to fall into. This error is in taking long strokes in drawfiling; because in such case the filings are apt to clog in the file teeth, producing what are technically termed "pins," that is, small pieces of iron which stick fast to the file and cut scratches in the work, entailing a large amount of extra work to file such scratches out. It is obvious that the brains must not be wool-gathering when drawfiling is under operation; for good judgment, strict attention, careful manipulation, and perfect confidence must be combined to produce good work. An error in selecting the part of the file to be used, or an error in applying that exact spot to the requisite place in the work, will produce a hollow spot in the work, which, if the latter is down to its proper size, can never be remedied; while want of judgment as to the quantity of metal requiring to be removed will cause either a badly finished job or else consume more time in testing the work than in filing it. *Apropos* of this latter fact, a well known master mechanic related to us the other day a piece of advice once given by a skillful workman, A, to an artisan, B, who, though a very industrious, painstaking man, was, from lack of experience, somewhat the reverse. A had employed B to work for him by the piece; and giving him a locomotive guide bar to file up, he first told him to test the bar. Then, giving him a rough file, he said: "Now file off as much as you think is necessary, and don't be afraid of it; when you have done so, come and tell me." B set to work with a will; and in a quarter of an hour he came to A, saying that he had filed off what he considered ample. "Go back to your vise," said A, "and file off just as much more. "But—" said B. "There are no 'buts' in the case," said A; "do exactly as I tell you." B set doggedly to work, and obeyed orders; and on testing the job, it required a little more filing in the same places. "This," said our visiting master mechanic, "was a lesson I never forgot and have often remembered to my advantage." The moral here pointed is founded upon a fact which any one who watches the manipulation of vise hands (upon all but very small work) will speedily observe, namely, that, for lack of cultivating the judgment, it often takes more time to try and retry the work than it does to file it. Fitting journal brasses, keys, dies, and sliding blocks, and filing very true flat surfaces, may be instanced as classes of work in which this is liable to occur.

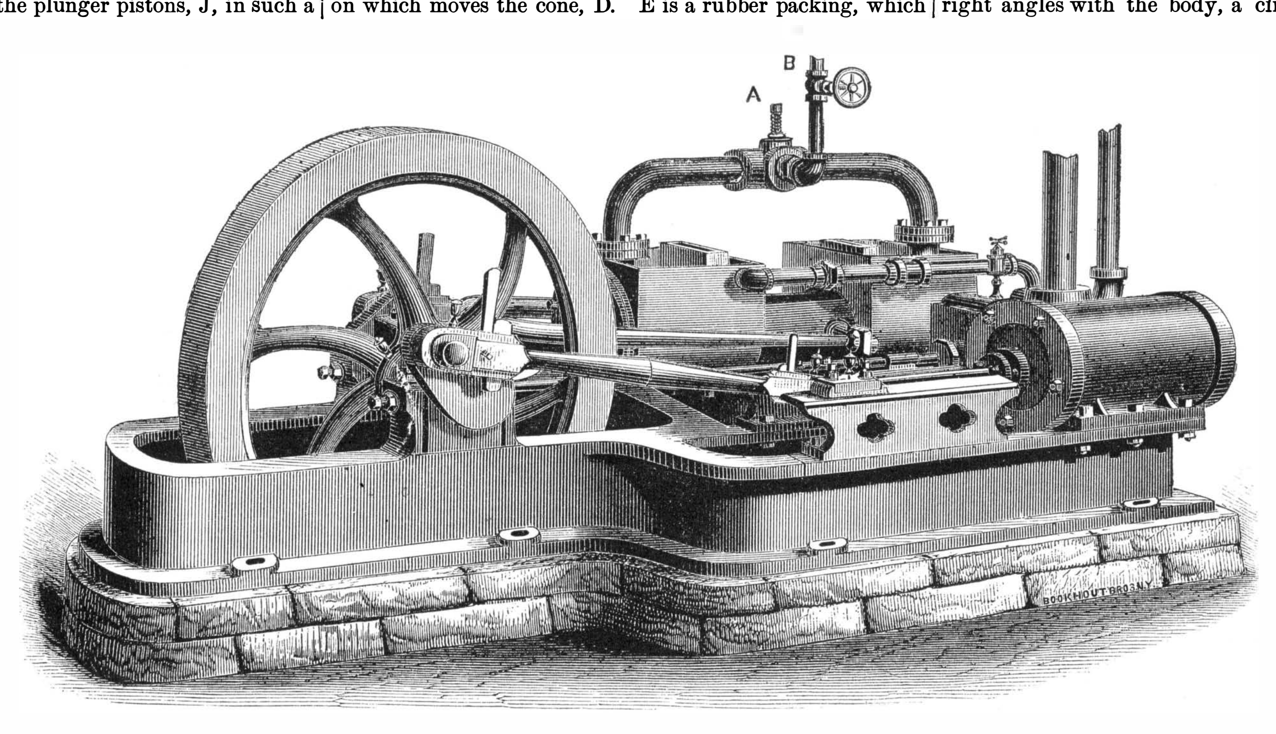


HOW TO DO IT, AND HOW NOT TO DO IT.

IMPROVED HIGH SPEED DRY AIR COMPRESSOR.

We illustrate herewith a new and very compact form of air compressor, designed for obtaining any desired pressure per square inch for driving rock drills, transmitting messages, forcing sand blasts, and, in general, all pneumatic purposes. The perspective view, Fig. 1, shows the engine side of the machine; Fig. 2 represents a section of the compressing cylinders. Motion is imparted to a forked rod which is attached to the center, *g*, of the plunger pistons, J, in such a way that facility is afforded for the adjustment of said pistons relatively to the discharge valves of the compressor in order to meet disturbances consequent on wear and for tightening up the driving connections.

It will be observed from the section, Fig. 2, that there is in reality but one piston, each end of which works in a separate compression cylinder. Each end is tightly packed; and in each end face is a valve, the stem of which is surrounded by a coiled spring, I. At the compressing end of each cylinder is an enlargement, H, formed by the extension of the cylinder. This is constructed to form a seat for the outlet valve, G, which is held up to the shoulder by the spring, *e*, which surrounds its stem. At *d* is the air outlet.



GUILD & GARRISON'S AIR COMPRESSOR.—Fig. 1.

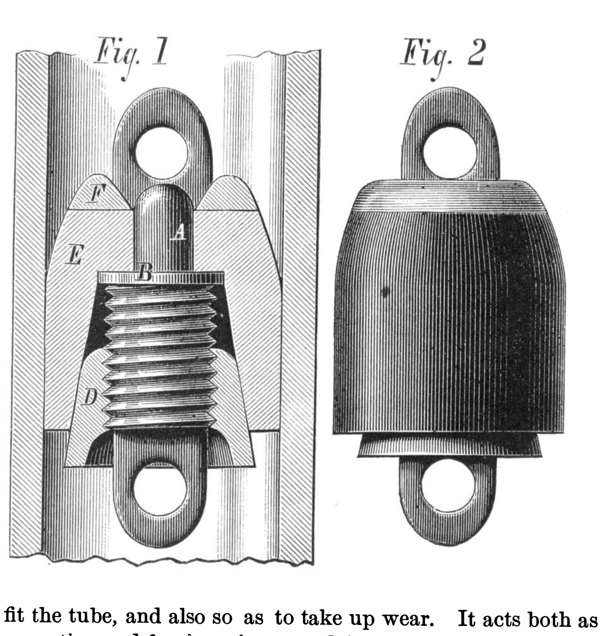
When the piston makes an inward stroke, its valve, I, of course closes, and the air is compressed before the piston and against the valve, G. As soon as the pressure on the latter exceeds the oppositely acting pressure of its spring, the valve opens; and the compressed air then escapes through the outlet, *d*. As soon, however, as the pressure is sufficiently reduced, the valve spring reacts; and as the piston at the end of its path projects for about $\frac{1}{16}$ inch into the enlarged portion, the valve comes back directly against it and follows it until once more forming a flush joint with the shoulder. Meanwhile the valve in the piston opens, and air enters between the same and the valve, the piston continuing its rearward stroke until past the orifice, *f*, which opens directly into the air, and thus a full supply is insured, ahead of the piston, before it begins another compressing stroke. Of course the reverse operation is going on in the opposite cylinder; and in this way the action is rendered continuous.

It will also be noticed that there is not only an absence of ports and passages, but that no water whatever is used in the air cylinder; so that the danger of wear from gritty particles in the same is entirely obviated. The water necessary for cooling is applied only on the outside in the jacket, C. Any kind of water may be used without injury to the compressor. As the areas of opening in the inlet and outlet valves are very large, they require but a slight motion to admit or release the air, consequently the machines may be run at a high rate of speed, from 175 to 200 revolutions, and are made light in weight when compared with the amount of work they are capable of performing.

For further particulars, address the manufacturers, Messrs. Guild & Garrison, 34 to 44 First street, Brooklyn, E.D., N.Y.

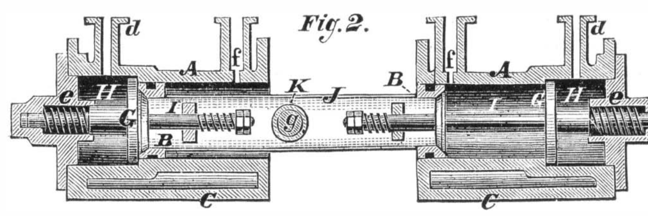
KENYON'S ADJUSTABLE RUBBER BUCKET FOR CHAIN PUMPS.

The annexed engraving represents a new rubber bucket for chain pumps, which may be adjusted so as to accurately



fit the tube, and also so as to take up wear. It acts both as a suction and forcing piston, and is claimed to raise water from deep wells at a small expenditure of power. Fig. 1 represents an exterior view, and Fig. 2 a sectional view of the device.

The link, A, is provided with an eye at each end, for attachment to the chain; and on its upper portion is formed a collar, B, which receives and sustains the downward pressure of the columns of water, and thus prevents the said pressure forcing the rubber downward and expanding the same. On the link and below the collar is a screw thread, on which moves the cone, D. E is a rubber packing, which can be expanded outward to fit the pump tube by moving the cone, D, inward; or it may be adjusted so as to enter a smaller tube by moving said cone in the reverse direction. A metal washer, F, is placed on top of the rubber packing, and prevents the same from being forced out of place by the cone, D. This washer has a longitudinal slot, whereby it may be slipped over the link eye. It is then rotated a quarter turn, so that it cannot come off; while the pressure of the rubber prevents its turning backward. The cone, D, is easily moved by grasping the rubber packing in one hand



and turning the link, A, by means of a wrench held in the other.

Patented April 17, 1877, through the Scientific American Patent Agency. For further particulars, address the inventor, Mr. Thomas Kenyon, P. O. box 103, Hamilton, Butler county, Ohio.

Marvels of Man.

While the gastric juice has a mild, bland, sweetish taste, it possesses the power of dissolving the hardest food that can be swallowed; it has no influence whatever on the soft and delicate fibers of the living stomach, nor upon the living hand, but, at the moment of death, it begins to eat them away with the power of the strongest acids.

There is dust on sea, on land; in the valley, and on the mountain top; there is dust always and everywhere; the atmosphere is full of it; it penetrates the noisome dungeon, and visits the deepest, darkest caves of the earth; no palace door can shut it out, no drawer so secret as to escape its presence; every breath of wind dashes it upon the open eye, and yet that eye is not blinded, because there is a fountain of the blandest fluid in Nature incessantly emptying itself under the eyelid, which spreads it over the surface of the ball at every winking, and washes every atom of dust away. But this liquid, so mild, and so well adapted to the eye itself, has some acridity, which, under certain circumstances, becomes so decided as to be scalding to the skin, and would rot away the eyelids were it not that along the edges of them there are little oil manufactories, which spread over their surface a coating, as impervious to the liquids necessary for keeping the eyeball washed clean as the best varnish is impervious to water.

The breath which leaves the lungs has been so perfectly divested of its life-giving properties that to rebreathe it, unmixed with other air, the moment it escapes from the mouth, would cause immediate death by suffocation; while if it hovered about us, a more or less destructive influence over health and life would be occasioned; but it is made of a nature so much lighter than the common air that the instant it escapes the lips and nostrils it ascends to the higher regions, above the breathing point, there to be rectified, renovated, and sent back again, replete with purity and life. How rapidly it ascends is beautifully exhibited every frosty morning.

But foul and deadly as the expired air is, Nature, wisely economical in all her works and ways, turns it to good account in its outward passage through the organs of voice, and makes of it the whisper of love, the soft words of affection, the tender tones of human sympathy, the sweetest strains of ravishing music, the persuasive eloquence of the finished orator.

If a well made man be extended on the ground, his arm at right angles with the body, a circle, making the navel its center, will just take in the head, the finger ends, and feet.

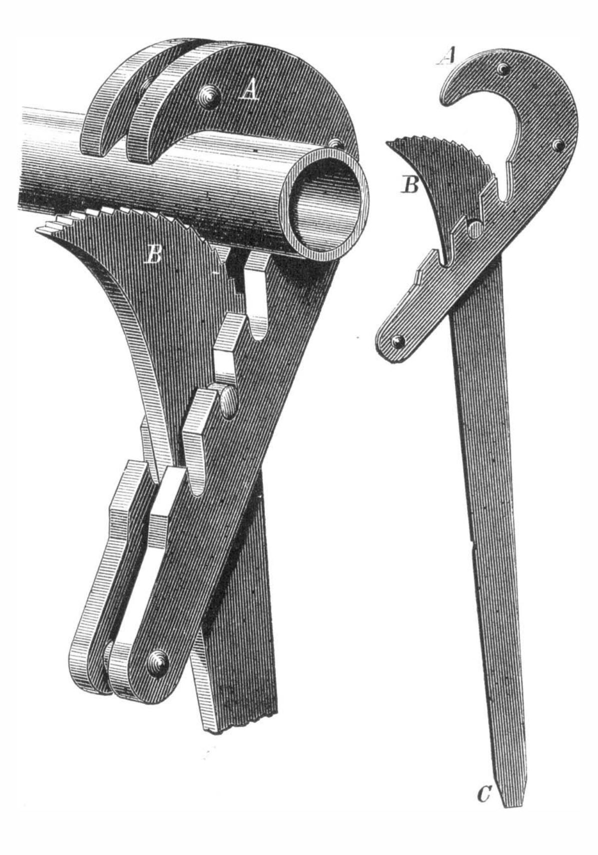
The distance from top to toe is precisely the same as that between the tips of the fingers when the arms are extended.

The length of the body is just six times that of the foot; while the distance from the edge of the hair on the forehead to the end of the chin is one tenth the length of the whole stature.

Of the sixty-two primary elements known in Nature, only eighteen are found in the human body, and of these, seven are metallic. Iron is found in the blood, phosphorus in the brain; limestone in the bile; lime in the bones; dust and ashes in all! Not only these eighteen human elements, but the whole sixty-two, of which the universe is made, have their essential basis in the four substances, oxygen, hydrogen, nitrogen, and carbon, representing the more familiar names of fire, water, saltpeter, and charcoal; and such is man, the lord of earth! a spark of fire, a drop of water, a grain of gunpowder, an atom of charcoal!—*Hall's Journal of Health.*

COMBINED PIPE TONGS, WRENCH, AND SCREWDRIVER.

The annexed engraving represents one of those useful tools which combine in themselves the capabilities of a number of constantly needed implements, and thus reduce both the cost and the bulk of the mechanic's working kit. At the same time, tools of this description are always handy to have about the house or the farm; as they afford a means of quickly doing many a little job of timely repairing, which may save more difficult work in the future. The present device is a combination of pipe tongs, wrench, and screwdriver, which implements the gas or steam fitter constantly requires. A is a double jaw or clamp, curved at one end to extend around the pipe or nut, as shown, and which has its parts laterally connected by stay pins. On the longitudinal portion of this jaw are notches which receive the pivot pin of the single jaw, B, which enters between the parts of jaw, A, and has an eccentrically shaped clamping end, which is serrated so as firmly to bind upon the object grasped. The lower end, C, of the shank of jaw, B, is tapered to form a screwdriver. When this portion is in use, the single jaw is drawn out, and the double jaw is reversed to form a handle.

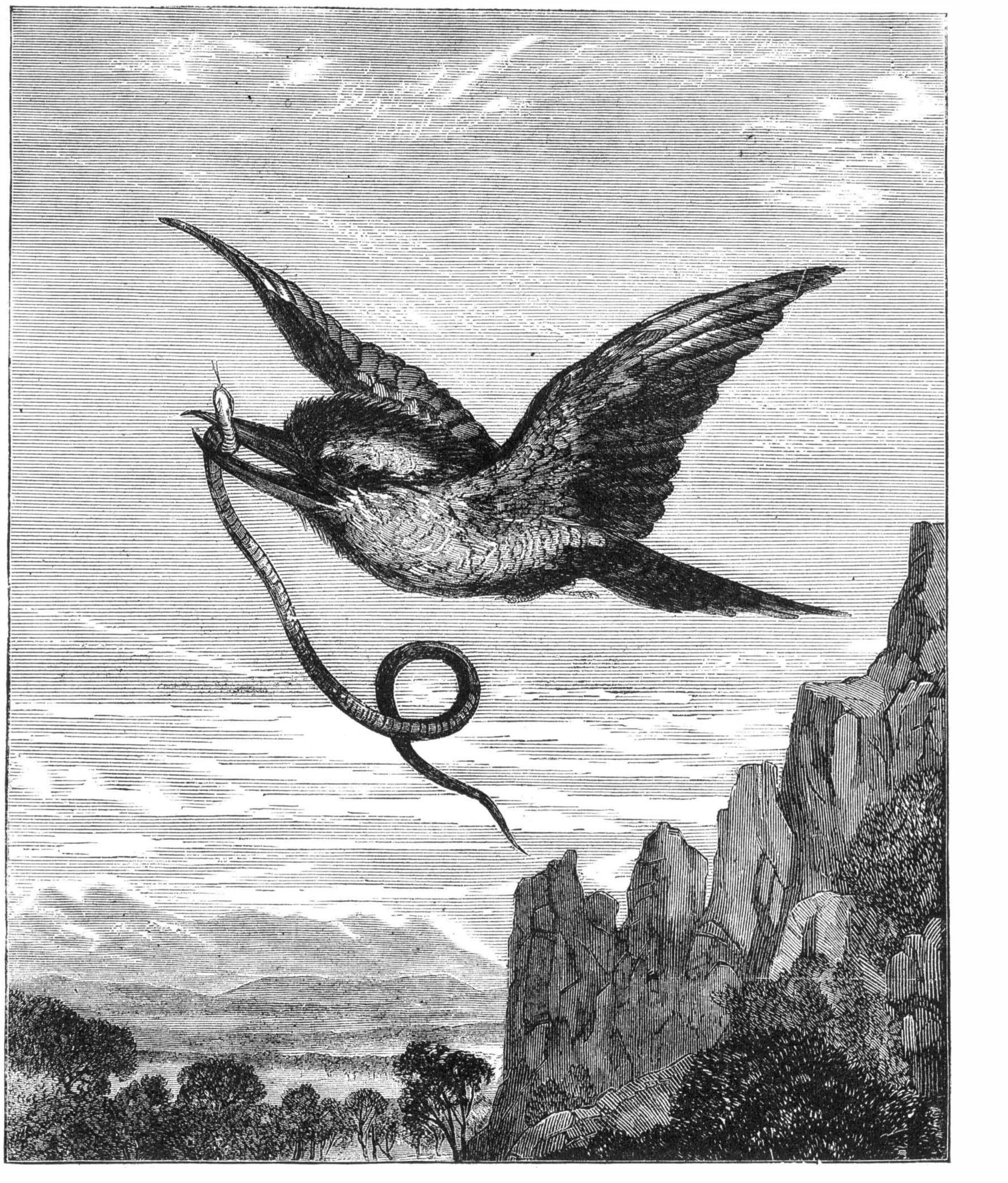


Patent pending through the Scientific American Patent Agency. For further particulars, and for tools, address the inventors, Messrs. States & Cook, Topeka, Kansas.

A REMARKABLE KINGFISHER.

There are over fifty species of the *halcyonidæ* or kingfishers; but none is more remarkable than the one shown in our illustration. From its peculiar screaming laugh, not unlike the bray of a donkey, it has obtained the name of "the laughing jackass." Its zoölogical name is *dacelo*, one species, *d. gigas*, being a large bird, 18 inches long, and endowed with strength and courage; it feeds indiscriminately on any animals of suitable size, whether quadruped, bird, reptile, fish, insect, or crustacean. It is a handsome bird, being brightly colored; and its flight is quick and noiseless. Its powerful bill makes it a very formidable enemy.

The *Illustrated News*, of Adelaide, Australia, from whose pages we select the engraving, gives the following particulars of this interesting bird: "The laughing jackass is almost too well known to need description. His appearance and extraordinary note are familiar to the inhabitants of every country village. Indeed, he frequently extends his researches into the neighborhood of towns, occasionally taking up his abode for life in some healthy suburb, and punctually entertaining the inhabitants thereof, morning and evening, with a succession of those singular sounds which have rendered his name famous. Although a kingfisher, he never procures his food from the water, after the orthodox fashion of kingfishers, but has more the habits of a bird of prey. Sitting motionless among the lower branches of some tall gum tree unnoticed, and apparently half asleep, he waits, like Micawber, for something to turn up. Suddenly, without noise, he drops off his bough and flies direct to a certain spot, whence he soon returns, bearing in his beak a lizard, a small snake, or perhaps a rat. His acuteness of sight is extraordinary. From his elevated post he seems to miss nothing, and discerns his prey in swamps and crevices of rocks at a distance that is perfectly astounding. The laughing jackass has the advantage of being able to live on almost anything that presents itself; hence it is always in good condition, and apparently in good humor. It seems, indeed, to pass its life in self-congratulations; and when four or five meet and unite their voices, and they invariably do, morning and evening, the noise would suggest the idea that a party of demons had broken loose and were rejoicing over some piece of successful mischief. But in spite of his careless, happy life, the laughing jackass has his peculiar duty, and he performs it conscientiously. Snake killing is his specialty: lizards, frogs, beetles, small birds, rats, etc., are his usual food. In fact, nothing comes amiss to him; let a snake appear upon the scene, and the laughing jackass recognizes his quarry at once. Never hesitating, he makes straight for it, his agitation being observable by the quivering crest feathers. With some caution, he swoops backwards and forwards, seeking an opportunity to seize the reptile. The snake, with head erect, ready to strike, keeps on the alert. The excitement continues for some time till the bird finally settles down, close by, on the ground. But all his stolid heavy appearance is gone. His wings and tail quiver with agitation and eagerness. Fully alive to the dangerous character of his opponent, he keeps at a safe distance. Flitting round, his head just out of reach, he continues to annoy him, till becoming exhausted, the snake affords him the opportunity he is seeking. With the rapidity of lightning the bird descends upon his prey, then rises in the air, bearing with him the captured snake, neatly held just behind the head, in such a position as to render him perfectly powerless. Rising until he has attained a considerable height, he directs his flight to a more open part of the country, then suddenly backing in the air, he drops the reptile, following it down and reaching the ground almost at the same time. Stunned and bruised, the unfortunate snake is in no condition to renew the contest, and is very soon despatched and eaten by his victorious enemy."



THE LAUGHING JACKASS OF AUSTRALIA.

The Secretary Bird.

A curious experiment took place the other day at the Jardin d'Acclimatation in Paris. A nest of living vipers was thrown into the inclosure where the secretaries or snake-eaters (from the Cape) are kept. These birds have the bright eye of birds of prey, powerful beaks, and vulture-like bodies mounted on legs like those of a wading bird. Whenever the secretaries saw the snakes they fell upon them with shrill cries, and an exciting struggle ensued. The reptiles fixed on the ground by the strong feet of the bird, twisted and hissed, and bit; but they could make no impression on the rugose skin, and they were chopped into mincemeat with a few strokes of the beak. The secretary is also, it may be remarked, a great destroyer of rodents.

Scarcity of Tanning Materials in Great Britain.

The scarcity of the vegetable products principally used in tanning has become so serious that the Tanners' Society of Bristol has officially brought the matter under the notice of the Council of the Linnean Society, in the hope that they may encourage a search by travelers for other plants having similar properties, or stimulate the cultivation of known ones. The supply of valonia from Surzena and Greece is this year very small; and as this is one of the most important tanning agents, much inconvenience has been experienced, and the trade has been compelled to seek other materials. Two new plants have been brought to market, but in such small quantities as to be of little use; but if their growth could be encouraged they would be very valuable. One is a small gall from the tamarix, growing in Morocco and also in India. It yields about forty per cent of tannin, which is of remarkably fine quality, and is at present used almost entirely for medicinal purposes. The other is the seed and pod of a kind of bean called *balsamo carpon*, and yields a tanning gum of great strength. It grows in mountainous districts in Chili. The seedpods are very soluble in water, and would need to be grown in a country where little rain falls.

To Cleanse the Woodwork Around Doors.

Take a pail of hot water; throw in two tablespoonfuls of pulverized borax; use a good coarse house cloth—an old coarse towel does splendidly—and wash the painting; do not use a brush; when washing places that are extra yellow are stained, soap the cloth; then sprinkle it with the dry powdered borax, and rub the places well, using plenty of rinsing water; by washing the woodwork in this way you will not remove the paint, and the borax will soften and make the hands white—a fact well worth knowing. The uses of borax in domestic economy are numerous; and one of the most valuable is its employment to aid the detergent properties of soap.

Underground Telegraphs.

The two valuable practical papers, "Underground Telegraphs," by Mr. Willoughby Smith, and "Underground Telegraphs in France," by Mr. John Aylmer, C.E., of Paris—which were read before the Society of Telegraph Engineers at their last meeting, on the 28th ult., has served to bring again into prominence the subject of covered telegraph lines.

Taking up a statement of Mr. Prescott's which appeared in the American *Journal of the Telegraph* some six or eight months ago, that the "use of underground telegraph lines had thus far been attended with very unsatisfactory results," Mr. Willoughby Smith sought to establish, and undoubtedly succeeded in establishing, the fact that underground telegraph lines need be attended with no greater risks than open lines—nay that, were the proper material only employed, and due care taken in the execution of the work, there is no reason why covered lines should not be made as safe and durable as need be desired. The most interesting feature, however, of Mr. Willoughby Smith's communication was the argument which he brought forward against the employment of tar on gutta percha covered wire. A covering of tarred tape is, as is well known, all but universally adopted at present as the final protective covering. This, it is alleged, is a grave mistake; for by reason of its use the insulation resistance is materially diminished, and the germs of decay, which in time lead to the complete destruction of the coating, are implanted in the gutta percha. The tar ought to be abandoned, and in its place tannin, whose employment was stated to have been highly satisfactory, ought to be adopted. In the valuable address delivered some time since by Professor Abel, at the Society's opening meeting, this same subject was dealt with, and the state of our knowledge with reference to the causes of decay in gutta percha was shown to be crude in the extreme.

Granting, however, that tar is an objectionable feature in the manufacture of gutta percha covered wire, was there not some point in what was remarked, by one of the speakers in the animated discussion which followed, that surely then Chatterton's compound was not altogether an unmixed advantage? Chatterton's compound consists of one part of Stockholm tar to one of resin and three of gutta percha, and has long been regarded as the panacea for every evil that could befall gutta percha covered wires. No coating can be considered complete, it is said, no wires can be welded homogeneously together, without Chatterton's compound; and if tar is the *bête noir* it is now stated to be, what becomes of the influence of Chatterton's compound? It is all very well to be told, as Mr. Willoughby Smith told us the other evening, that "in the compound the sting of the tar was taken out." It is a pity that the same process of sting-abstraction could not be applied with equal success to the tar in the tape. No, we shall wait for a few further data and a few additional experiments before condemning the tar wholesale and making it accountable for all the mischief; and we will be content to look for the deterioration of the gutta percha, to a very great extent at least, in the cheap and consequently indifferent material which has never been properly tested, and hasty manufacture over which no efficient check has yet been introduced.

No one will now attempt to call in question the possibility of manufacturing really good covered wires: the battle of india rubber and gutta percha need not be fought over again, for the improvements effected in the latter have been so decided of recent years that its position is well-nigh unassailable by its old rival. If danger is to be anticipated from any quarter, paraffin and the products of paraffin will probably show it the most dangerous front. Meanwhile, every one will admit that covered wires as good as need be looked for in the existing state of our knowledge can without difficulty be manufactured, and no one will deny that their laying is a matter which requires nothing more than care to be attended with success. When, therefore, the need for underground telegraphs on a more extended scale than at present does arise, either from the crowded state of the open lines on every available route, or from an alternative channel being thought desirable, we may rest perfectly satisfied that our telegraph engineers and electricians will be quite equal to the occasion; and if the day when that need does arise is even but a short way off, they may as likely as not turn round and regard our manner of doing things in much the same light as we regard the now antiquated attempts of but a few years back in the matter of covered lines.—*London Telegraphic Journal.*

Care of Horses' Feet.

When the foot is gone, there is no horse left. There is an old adage to this effect, the truth of which is incontrovertible. Yet no part of a horse's anatomy is worse used than the foot, and there are no more frequent diseases to which the notice of the veterinary surgeon is brought than those of the feet. This comes of the unwise yet obstinately maintained fashion of rasping, cutting, burning, tarring, and greasing the hoofs. It would occupy too much space here to describe the anatomy of the foot fully, but it is a very timely matter just now to consider the structure of the horny outer covering or crust of the foot, by which the delicate inner parts are protected.

Horn is a fibrous substance, which contains twenty-five per cent of water. The fact that it contains water in its normal composition is a very important one, and needs to be stated here, because, unless specific reasons are given, very little weight is generally accorded to all that may be written or said about the proper treatment of the horse's foot, by either horse owners, farmers, blacksmiths, or professional horseshoers. When horn is deprived of water it becomes dry, hard, and without elasticity, precisely like a piece of dry glue, which breaks and splinters into glassy fragments. It is necessary, therefore, that this water should be retained, to keep the horn in good condition. The common practices of burning the sole to procure a fit for the shoe, or rasping the outer surface to get a good shape, and of tarring and greasing the hoof, all tend to drive the water out of the horn, and not only to harden and contract it, but to make it brittle. In this condition its usefulness as a protection for the foot is at once impaired and partially destroyed. When the sole is burned by contact with a hot shoe, it is obvious that the water in the portion of the horn that is heated must be driven off. That is so obvious that no more need be said about it. When the smooth, polished, hard surface of the horn is rasped away, the softer inner fibrous portion is exposed to all the evil influences of evaporation and degradation, and the numberless pores and cells or interstices of the horn are enabled to give up the water they contain. The horn in this case is also made dry and brittle, and, of course, contracts. Tar contains an acid and a volatile oil, which evaporates and leaves a hardened pitchy mass. When tar is applied to a hoof the acid acts chemically upon the horn, and hardens or disintegrates it, and the oil, evaporating, leaves a space between the fibers filled with the hardened residue. It operates precisely in the same manner as when it is applied to leather—as a sole of a shoe, for instance—as a preservative: the leather in a few days becoming hard and unyielding, impervious to moisture, and dry. As with tar, so with grease; both these substances drive out the water from the horn and occupy its place, in time hardening and acidifying the substance of the hoof crust, rendering it brittle, and contracting it.

The substance of the frog is horn, but is of a softer and more open texture than the sole and crust of the hoof. It is, therefore, more easily affected by injurious conditions, and when it becomes deprived of its water it shrinks more than the more solid horn. From this explanation of the character of the horny covering of the foot any reasonable horse owner may learn how to treat the hoof, and how to avoid injuring it. When a shoe is to be fitted, the edge or wall sole should be prepared by cutting or rasping, and not by burning. Indeed the shoe should be fitted to the foot, and not the foot to the shoe. When, from bad management, the sole and frog have become dry and contracted, no grease or tar should be used; but water should be used freely, and then the hoof should be dressed with glycerin, which will mix with water, and does not displace it. Glycerin contains no acid or acrid properties, but is soft, bland, emollient, and does not evaporate. It therefore softens the horn, and allows the fibers to expand. Contraction is thus prevented, or overcome when it has actually occurred.—*New York Times.*

Culture of the Memory.

The student lamenting his lack of ability to remember his lessons, and, jealous of another who spends only half the time which he employs in their preparation, sees that his rival's memory always serves him in the recitation room, may take encouragement from the following, condensed from the Philadelphia *Public Ledger*:

It is a common idea that a good memory is a ready-made gift, which Nature whimsically confers upon some and withholds from others.

Now, the truth is that the memory is a faculty which, as much as any other, needs development. Its capacity is doubtless greater in some than in others by natural endowment, but this difference is less important than that which is caused by education or neglect. Whether for the purpose of facilitating mental processes, or of promoting practical efficiency in life's pursuits, a cultivated memory is much more valuable than a naturally strong one. We may be capable of amassing within our minds a vast amount of facts, or rules, or knowledge of any kind thrown together at random, without reaping any benefit, either in mental power or the conduct of affairs; but when the memory has been so trained as to retain what is confided to it in classified order and make it available at every moment of need, its value cannot be overestimated.

Like all our other powers, the memory is strengthened and developed by exercise, and weakened by disuse. In whatever direction we make constant demands upon it, it responds obediently. The merchant finds no difficulty in remembering the prices and qualities of goods in his own line; the physician easily recalls the daily symptoms of his patient; the mechanic does not forget the functions of his various tools. The same conditions, daily repeated, will almost invariably bring up corresponding ideas, and in our regular employments we seldom have occasion to complain of a poor memory. This may afford a clue to the cultivation of this faculty in directions where it is now defective. If we would have it faithfully serve us, we must keep it in constant use. The same attention which we bestow on our daily business, and which enables us to recall its details with so much ease, will be equally effective if exercised in other matters. To strengthen the memory on any given point, the first requisite is to bring all our mental energy to bear upon it. We are charged with some message or commission, perhaps, which we promise in all good faith to convey or to execute; but not being in the line of our thoughts, it passes out of our minds and is unfulfilled. We commonly excuse ourselves for such dereliction, on the ground that we are unable, by any effort of the will, to command the power of memory. Yet had we, by a strong self-control, fixed our attention wholly upon the matter when presented to us, had we dismissed all wandering thoughts and concentrated our mental energies for the time upon that one thing, the impression would have been so strong that, in all probability, it would have been remembered and accomplished. This mental concentration is the first and most important means of improving the memory. It is largely within our own powers of will to enforce this, and he who is conscious of neglect in this respect cannot claim to be excused for forgetfulness.

Another valuable method of training the memory is through the laws of association. Our knowledge must be arranged and classified if we would recall it with facility. We must base rules upon principles, and effects upon causes, if we would imprint them firmly on our minds. That this is not done with sufficient thoroughness is the chief cause why so much of the knowledge which we acquire passes from us. The Emperor Napoleon, who was one of the most marked instances of a retentive mind, used to say of himself that his knowledge was all laid away in drawers, and that he had only to open the proper drawer and all that he had acquired on that subject was at once presented before him.

This is, as we have before hinted, one great need in our present systems of education. To take up a single study leisurely, presenting it to the student in all its relations, and leading him to trace its principles from their foundations up to their highest known results, is of far more real value, both as a mental discipline, and as a permanent acquisition of knowledge, than to skim over the surface of twenty branches, overloading the mind with isolated facts or rules, bearing no apparent connection with each other, and thus fixing no tenacious grasp upon the memory.

There is one great encouragement to the cultivation of the memory in the fact that the work will grow easier with every effort. If we patiently and steadily fix our attention on every subject we wish to recall, the power of concentration will become habitual. If we constantly arrange and classify our knowledge, it will grow more and more available.

Umbrellas, Past and Present.

Count d'Orsay, when reminded that, if he persisted in his extravagance, he would soon be unable to afford himself a carriage, replied that when he could not afford a carriage he would carry the best umbrella in London. The Count was true to his word, nor had he any reason to blush for the cheap and serviceable instrument. In the West it had been no doubt more used than honored; but looking to the East he found abundant sanction for his adoption of the unassuming umbrella. In bearing one he only followed in the steps of the kings and princes of Nineveh, Egypt, India, and China. From time immemorial, the contrivance for warding off the sun's rays and casting an artificial shade has been symbolical of the supreme human authority that can convert light to darkness, and in a trice drive ordinary mortals from the brightness of life to the gloom of death. No fitter emblem of his awful power could be imagined for the potentate who, by a word or a nod, could extinguish towards any of his creatures the sun of earthly happiness, and banish them suddenly to the abodes of gloom and despair, or could go yet further and by a glance put out the light of life. At every point of Oriental story one encounters the symbolical umbrella in literature and art. In the fifth incarnation of Vishnu, when the god goes down into hell, he bears in his hand a sun-shade. In like manner old bas-reliefs represent Dionysius bearing a parasol when he is descending to the infernal regions. To be a king in the East has from the remotest antiquity implied a right to bear an umbrella; and to be preceded by umbrellas has signified royal quality in the person following them. Indeed, the Eastern title with which we are more familiar than any other, signifies King of the Eternal Gingham. Satrap is a corrupt abbreviation of Ch'hatra-pati, *i.e.*, Lord of the Umbrella, the title of the Mahratta Princes who reigned at Poonah and Sattara. The King of Ava's designation was "King of the White Elephant and Lord of the Twenty-four Umbrellas." Writing to the Marquis of Dalhousie some two and twenty years since, the King of Burmah styled himself "His great, glorious, and most excellent Majesty, who reigns over the kingdoms of Phunaparanta, Tampadipa, and all the great umbrella-wearing chiefs of the Eastern countries." No English foxhunter would care to ride to the coverside at the tail of a company of walking or mounted umbrella bearers; but when the Emperor of China goes forth to hunt he is preceded by twenty-four umbrellas. Passing westward, the umbrella was adopted by the ancient Greeks and Romans, as a symbol of power, and a dainty article of feminine costume. The Greeks used it as a symbol in some of their sacred festivals, and put it in the hands of gentlewomen. Aristophanes and Pausanias both mention the lady's *skiadion.* Bestowing it on their women kind of high degree, the Romans also elevated it in their halls of justice as a symbol of authority. A red umbrella was the symbolical canopy under which the Roman judge sat in the basilikon; and when the basilican law courts were devoted to religious uses and passed into the hands of Christian clergy, the new owners of the consecrated judgment halls were quick to see their advantage in assuming the emblematic umbrellas. Hence the red canopy became the distinctive ensign of the cardinal priest. In his church he officiated, at public gatherings outside his church he walked, beneath it. In course of time he dispensed with the real canopy and its bearers during public promenades, and substituted for it a small red canopy so made that he could bear it for himself on his own head. The cardinal's scarlet hat is but a modified and cleverly adapted umbrella. It is the direct outcome of the old symbolical sun-shades of the Oriental despots. That our English umbrella has the same magnificent descent is shown by its name, which signifies shade-maker. Lineal, though remote, offspring of the Biblical "shade defending from the sun," the modern umbrella was brought from Italy to England by Tom Coryat, who describes it in his "Crudities" (1611) as "something answerable to the form of a little cannopy, and hooped in the inside with divers little wooden hoopes that extend the umbrella in a prety little compass," and he introduced it into England as a parasol. It was so natural for the ladies who used it against the sun to use it also against the rain, that one may presume the umbrella was at once employed in our humid climate as much for the one purpose as the other. So early as 1620, Drayton described it as a thing " to shield you in all sorts of weathers;" but the original and true purpose of the ancient invention was not lost sight of till long afterwards. In "Rule a Wife and have a Wife," Beaumont and Fletcher say:

> "Now you have got a shadow, an umbrella,
> To keep the scorching world's opinion
> From your fair credit."

The closed sun-shade borne by the black page in the frontispiece to John Evelyn's "Kalendarium Hortense" (1664) is perhaps the earliest notice of the umbrella by pictorial art in this country. Between 1664 and 1710 umbrellas for protection against rain had become so common that, as we have seen, every tucked-up sempstress of Queen Anne's London had one. The umbrella which Under Sheriff Beardman permitted a footman to hold over Dr. Shebbeare's head in 1758, when that unfortunate gentleman of letters paid the penalty of his indiscretions by standing in the pillory, was doubtless an unusually strong contrivance, as it was used to ward off brickbats and rotten eggs, as well as to conceal the face of the culprit.

Though they did not invent the umbrella, the English have done much to develop and bring it to perfection. Between October, 1786, and July, 1871, no less than 292 improvements on the ordinary walking stick were patented in this country; and though some few of these patents refer to undraped batons, some 270 of them are for portable canopies. A considerable proportion of these open letters were granted for improvements in one or another of the subordinate parts of the sun-shade—such as ribs, stretchers, tips, handles, ferrules, notches, springs; but the majority exhibit specifications that affect the general design or chief materials of the article. Indeed, an entire volume might be written about all the various projects for a perfect umbrella. The rhabdoskidopheros is an umbrella, with the drapery folded into a hollow stick, from which the canopy shoots forth and expands itself in a trice on the touch of a spring. The MacGregor umbrella may be used with equal effect against the rain or one's natural enemies, as it is fitted with a spear, and may be used as a bayonet. Just thirty years since an umbrella was invented for people with chilly hands, which had a curious little heating apparatus set in its handle. Draped canes have been fitted with sun dials, compasses, and watches. The lady's parasol riding whip is familiar to every one; but it is not every one who has seen a needle-gun cane, a fishing rod, and a pipe stalk fitted with a canopy for the protection of the sportsman or smoker. What would dear old Isaak Walton have thought of a fishing rod fitted with an umbrella? The special feature of another umbrella is a long falling curtain that, on the expansion of the *parapluie,* hangs from the tips of the ribs and the edge of the covering to the ground. When he is in motion, the bearer of this umbrella has the appearance of an unusually tall and animated pillar post; and in order that he may see his way, the falling curtain is provided with a little glass window, bow or otherwise, through which he can gaze on the astonished world. To another inventor we are indebted for an umbrella whose hollow staff is furnished with a pistol, some charges of ball and powder, a screw telescope, pen and ink, paper, pencil, and a small knife. In the automaton umbrella the stretchers are put so high that the canopy can be brought down close over the bearer's head. The club umbrella, invented only a few years since, was peculiar in having a handle that could be unscrewed, so that on removing the handle and putting it into his pocket the owner might leave the canopy in the hall with an agreeable confidence that he would see it again on leaving his club, as no one would care to "borrow" a handleless umbrella. But this ingenious contrivance failed to find favor in Pall Mall, because it was felt to be an unclubable act for a man to enter his club with an umbrella that implied a distrust of the honesty of the members of his joint-stock home. It is almost needless to say that the perfect umbrella of the future will combine all the features of all the previous umbrellas —that it will be a fishing rod, fowling piece, driving whip, sword stick, bayonet, tobacco pipe, writing desk, and pillar post tent, and have its handle fitted with a fireplace, a repeating watch, and a compass, and will weigh only eight ounces avoirdupois, the weight of the most delicately constructed Paris umbrella.—*Hatters' Gazette.*

Fishing Extraordinary.

There are extraordinary ways of fishing practised by people of uncivilized countries, which are not the result of ignorance, but of that ingenuity which is always rendered fruitful by dire necessity and the instincts of self-support.

A method employed by the Chinese is generally practised at night, and depends upon a peculiar power which a white screen, stretched under the water, seems to possess over the fishes, decoying them to it and making them leap. A man, sitting at the stern of a long narrow boat, steers her with a paddle to the middle of a river, and there stops. Along the right hand side of his boat a narrow sheet of white canvas is stretched; when he leans to that side it dips under the surface, and, if it be a moonlit night, gleams through the water. Along the other side of the boat a net is fastened so as to form a barrier two or three feet high. The boatman keeps perfectly still. If another boat passes by, he will not speak; he is only impatient at the slight breaking of the silence. While he keeps thus without a sound or stir, the fish, attracted by the white canvas, approach and leap, and would go over the narrow boat and be free in their native waters on the other side, but for the screen of netting, which stops them, and throws them down before the man's feet.

Every one must have heard of the fishing cormorant, which is actually trained in China to catch fish. A man takes out ten or twelve of these web-footed birds in a boat, and as soon as the boat stops, at his word they plunge into the water and begin at once searching for and diving after fish. They are most diligent workers, for, if one of them is seen swimming about idly, the Chinaman in the boat strikes the water near the bird with the end of a long bamboo; and, not touched, but recalled to a sense of duty, the cormorant at once turns to business again. As soon as a fish is caught, a word from the man brings the bird swimming towards him. He draws it into the boat, and it drops its prey from its bill. There is always a straw or string tied round the neck, to prevent the fish from being swallowed, and this string requires the nicest adjustment, lest it may choke the bird—a result which would certainly follow if it slipped lower down on the neck. The sagacity and workman-like method of the birds are shown when they get into difficulties. If the fish caught is too large for one beak to secure, another cormorant comes up to the struggle, and the two with united efforts bring their prize to the boat. On the rivers and canals near Ningpo, Shanghae, and Foo-chow-foo, the employment of these birds is by no means an uncommon sight; but they are never to be seen fishing in the summer months, their work being in the winter, beginning always about October and ending in May. The birds have of course to be subjected to a system of training, which is carried on in the cormorant breeding and fishing establishments, one of which is at a distance of thirty or forty miles from Shanghae.

A still more singular practice is to be found amongst the Chonos Indians, who train dogs to help them on their fishing expeditions in much the same way as the shepherd's dog helps the shepherd. The net is held by two men standing in the water, and the dogs, swimming out far and diving after the fish, drive them back towards it. They enjoy their work just as a good horse, though hard pressed, seems to enjoy the hunt; and every time they raise their heads from the water they tell their pleasure by clamorous barking. The Fuegians, one of the most miserable and degraded races on the earth, train their dogs in a similar manner to assist them in catching birds and sea otters. In times of famine, they kill the old women of their tribe rather than sacrifice their dogs, alleging, as Peschel says, that dogs catch otters, and women do not. They have a wonderful contrivance for killing the sharks which abound off their coasts. A log of wood, shaped so as to appear something like a canoe, is set afloat, with a rope and large noose hanging from one end of it. Before long a shark attacks the supposed canoe, swimming after it, and is caught in the noose, hanging from the stern. It closes on him so that he cannot extricate himself, and the weight of the log keeps him swimming slowly without being able to sink. Then the Fuegians in their canoes, generally steered by women, approach at their leisure and finish the shark with their spears.

All these contrivances of savage nations, or of the strangely civilized Chinese, are meant to kill or seize the fish by natural means. It is much nearer home that we have to look to find the element of superstition prevailing, and useless customs invested with the importance of charms. An instance may be found in the case of the Sicilian fishermen, who, when in search of swordfish, chant a jargon of words the meaning of which even they themselves do not know. The song is supposed to be some old Greek verses, which, by time and use among those ignorant of their meaning, have become so altered as to be almost unrecognizable. The fishermen regard the medley as a sure means of attracting the swordfish, which they harpoon from the boat, when the charm, as they suppose, has brought them within reach.

Far away in northern regions there is a novel method of fishing under ice, which shows more ingenuity than the simple lowering and fastening of a net. A small square hole is cut in the ice, and in this is placed an upright stick, supported by a cross pin run through it and resting at each side on the ice: the end of the stick below this cross pin is short, and to it the line is fastened with the bait and hook attached, while at the top of the stick is a piece of colored rag. Now, though we have called the stick upright, it is meant to fall from that position and lie along the ice, until a fish seizing the bait pulls its lower end, when with a jerk it rises. This contrivance is called a tip-up, from the movement which is certain to follow the seizure of the bait. The fluttering of the colored rag, as the stick rises, tells of capture; and a great number of these self-acting fishers and indicators may be placed near together, each having its own hole in the ice; and each, by the fluttering rag, telling its own tale the moment a fish is caught.

The tip-up not only saves the fisher the trouble of holding his line in position and watching with particular care, but also makes the fish itself strike and announce that it is ready to be pulled out!

With bodies blackened by the sun to the color of the seaweed, the Japanese fishermen are incommoded by neither the rain nor the winds. Like the fishermen of all lands, their restless eyes were wandering from the sea to the heavens. With no guides but the stars by night and the blue edge of the land by day, there was need for keen eyesight and watchfulness. In all the Eastern seas there is no more adventurous race than these men.

We could see the floats of burnt wood which buoyed the ends of our fishermen's lines, and to the nearest of these we were sculled. A kind of wood light and buoyant, and with some resemblance to cork, is used for such floats. It grows in the forests thereabouts, and, after being shaped and charred to prevent decay, lasts, without further trouble, for a longer time than bladders or skins. With some impatience the black buoy and the line attached are brought on board. Like an inverted bell-shaped flower pot comes the first earthenware jar, hardly the size of a child's head, attached to the line. Mouth downward, the jar is pulled up from the bottom, and when all the water has been poured out, the fishermen give a look inside. No occupant being found, the jar is once more lowered into the sea by the attached string, which is overrun till the next jar is pulled up, brought on board, and similarly examined. When six or seven are examined, and no occupant is found in any of these, the fishermen show no impatience. But presently from a jar an octopus is jerked upon the floor of the boat, and with some satisfaction the Japanese watch its tentacles wriggle all about the planks and cling round their legs. Changing its hues, the disgusting cephalopod loses its redder blotches for paler patches, and eventually crawls into a darker corner to coil itself away. Pouring the water more carefully from the inverted pots, the fishermen secure a few more of these animals, which crawl and twine about with snakelike contortions. The long string of pots took time to overhaul, but the spoils were reckoned reward for the trouble. When the fishing was completed, and the black floats were again left to mark the spot, our boat was sculled somewhat further down the land.

We had then time to learn something more of this fishing for tako, as the octopus is named by the Japanese fishermen. Through our friends, we learn that the tako needs no bait to entice it to enter the earthen jars used by the fishermen to entrap it; but crawling about on the bottom, or shooting itself through the sea by the expulsion of water, it finds in the dark earthen jar "a comfortable house," and so occupies it until the fisherman finds it and captures it. The tako is largely eaten in Japan, where all the products of the sea are accounted equally wholesome with those of the land; and beneath an ugly skin the flesh of this speckled monster is thought very good, cooked in several ways, and eaten with or without soy or vinegar. Nevertheless, as if to vindicate the dread its constantly changing hues excite, the eating of the octopus is not unattended with danger. Through some poisonous taint, either occasionally or always present, but modified by the process of cooking, people sometimes die from eating this animal. And yet the knowledge of this interferes but to a trifling extent with the use of food having such a questionable reputation—indeed, at certain seasons, it is largely used by the Japanese, when the cuttle fish are far more plentiful and also more wholesome. Caught by trolling a small wooden fish barbed with hooks, they make good sport, chiefly to the older fishermen, who are not active enough to go off to sea.—*Chambers' Journal.*

DECISIONS OF THE COURTS.

Supreme Court of the United States.

CORSET PATENT.—MORITZ COHN, APPELLANT, VS. THE UNITED STATES CORSET COMPANY, JOHN H. LANE, AND WILLIAM LYALL.

[Appeal from the Circuit Court of the United States for the Southern District of New York.—Decided October Term, 1876.]

A patent is invalid if the invention claimed is found to be patented, or described in a printed publication prior to the patentee's invention or discovery thereof; and it is enough if the thing patented is described, and not the steps necessarily antecedent to its production.

Thus, when the invention claimed is an article, it is not necessary, in order to render the patent void, that the prior publication should also contain a description of the process by which such article was made.

Unless the earlier printed and published description does exhibit the later patented invention in such a full and intelligible manner as to enable persons skilled in the art to which the invention is related to comprehend it without assistance from the patent, or to make it, or repeat the process claimed, it is insufficient to invalidate the patent.

Mr. Justice Strong delivered the opinion of the court.

A careful examination of the evidence in this case has convinced us that the invention claimed and patented to the plaintiff was anticipated and described in the English provisional specification of John Henry Johnson, left in the office of the Commissioner of Patents on the 20th of January, A.D. 1854. That specification was printed and published in England officially in 1854, and it is contained in volume second of a printed publication circulated in this country as early as the year 1856. It is, therefore, fatal to the validity of the plaintiff's patent, if, in fact, it does describe sufficiently the manufacture described and claimed in his specification. The plaintiff's application at the Patent Office was made on the 30th of January, 1873. In it he claimed to have invented "a new and useful improvement in corsets." After reciting that previous to his invention it had been customary in the manufacture of corsets to weave the material with pocket-like openings or passages running from edge to edge, and adapted to receive the bones, which are inserted to stay the woven fabric, and which serve as braces to give shape to and support the figure of the wearer, but that it had been necessary, after the insertion of the bones into said pocket-like passages, to secure each one endwise by sewing, he proceeded to mention objections to that mode of making a corset. He specified two only. The first was that it involved much hand labor and consequent expense in sewing in the bones, or securing them endwise in the woven passages; and the second was that the arrangement or placement of the bones in the passages had to be determined by hand manipulation, and that it was therefore variable and irregular, such as frequently to give to the corset an undesirable shape or appearance near its upper edge. These objections he proposed to remove, and to produce a corset in which the location or position endwise of the bones shall be predetermined with the accuracy of the jacquard, in the process of weaving the corset stuffs or material, thereby effecting the saving of labor and expense in the manufacture. He therefore declared his invention to consist in having the pocket-like openings or passages into which the bones are put closed up near one end, and at that point at which it is designed to have the end of each bone located. * * * Amendments were then made until his present patent was at last granted, dated April 15, 1873. In the specification which accompanies it the patentee admits what he admitted at first, that prior to his invention it had been customary in the manufacture of corsets to weave the material with pocket-like openings or passages running through from edge to edge, and he makes the further admission that it had been customary to weave the material with such passages all stopped and finished off at uniform distances from the edge. He therefore disclaims "a woven corset with the pockets stopped and finished off at a uniform distance from the edges," and he disclaims also "a hand-made corset with pockets of varying lengths stitched on," and his claim is: "A corset having the pockets for the reception of the bones formed in the weaving, and varying in length relatively to each other as desired, substantially in the manner and for the purposes set forth."

NEW BOOKS AND PUBLICATIONS.

STRENGTH AND CALCULATIONS OF DIMENSIONS OF IRON AND STEEL CONSTRUCTIONS. Translated from the German of J. J. Weyrauch, Ph.D. New York city: D. Van Nostrand, 23 Murray and 27 Warren streets.

Another translation of this same work has already been briefly noticed in these columns; and we expressed the view that the contents of the volume were not in such practical form as would adapt it to the uses of the working eng neer. The present translation seems to us much less open to that objection, and certainly it contains an immense amount of useful data, entirely outside the formulæ, besides examples tending materially to elucidate the latter. The book is rendered much more practical; and its whole arrangement is, to our minds, better and well calculated to render its various topics more accessible to the student. As regards the intrinsic merits of Professor Weyrauch's work, and in our previous strictures on the other translation, we intended no disparaging reflection upon them; they are undoubtedly great, and the volume should be carefully studied by all engineers. It is based on a general view of the results obtained in the extended course of experiments made in Europe and in this country to determine the properties of iron and steel. As these trials have shown the somewhat startling fact that (to quote Professor Weyrauch) "the method hitherto employed in calculating the dimensions of iron and steel constructions have been entirely wrong," it is hardly necessary to point out the importance of any work which deduces a formula which gives all "the requisites for a simple and rational determination of dimensions."

VICK'S HORTICULTURAL PUBLICATIONS.—The enterprising Rochester seedsman, James Vick, has just issued his annual "Illustrated Catalogue" and "Guide Book," which are of interest to every farmer, in fact, to every class of persons living in the country. Mr. Vick's publications have always been signally well printed; but this year they seem to be more handsomely executed than heretofore. They contain useful information for vegetable growers, flower raisers, and amateur farmers. Coming first among the list before us, the largest, handsomest, and most expensively executed is the "Flower Vegetable and Garden," a book of 165 pages, full of engravings, some of which are full-page colored chromos of fruits and flowers. The next in importance is the "Illustrated Catalogue of Seeds and Bulbs," and then the "Floral Guide." These three distinct publications can be had of the publisher for 75 cents; and we know of no other way of obtaining so much practical knowledge and information for so small a sum as is afforded in these publications.

EVERY MAN HIS OWN LAWYER.—A new edition, revised and improved, of Wells' "Lawyer," comprising forms for drawing legal papers of all kinds and embracing a synopsis of the leading statutes existing in each State, has just been issued. The original edition of this work, and the several subsequent ones, have aggregated an enormous sale, and are to be found in a great many offices and households throughout the country. But the lapse of time has wrought such changes in the statutes of various States that the author has found it desirable to revise the whole book. The professional man, the farmer, the mechanic, the manufacturer—in fact, all classes of the community—will find the work useful for reference, and of great assistance in drawing deeds, making transfers of property, granting powers of attorney, or conferring licences, and a handy and reliable adviser, saving lawyers' fees to the possessor and teaching him his legal rights. The book is printed in both English and German. The price for English edition, by mail, is $2.25; for the German edition, $2.50. Sold by the author and publisher, J. G. Wells, No. 1 Great Jones street, New York city.

Recent American and Foreign Patents.

Notice to Patentees.

Inventors who are desirous of disposing of their patents would find it greatly to their advantage to have them illustrated in the SCIENTIFIC AMERICAN. We are prepared to get up first-class WOOD ENGRAVINGS of inventions of merit, and publish them in the SCIENTIFIC AMERICAN on very reasonable terms.

We shall be pleased to make estimates as to cost of engravings on receipt of photographs, sketches, or copies of patents. After publication, the cuts become the property of the person ordering them, and will be found of value for circulars and for publication in other papers.

NEW MISCELLANEOUS INVENTIONS.

IMPROVED LAST.

Charles E. Cree, Marlborough, Mass., assignor to himself and J. E. Curtis, of same place.—In this last the block is firmly held in place and prevented from slipping back while the shoe or boot is being lasted, so that the shoe or boot will have its full intended size. The block is wholly within the last, having no projecting part to come in contact with the upper while upon the last; and the last and block are kept together, except when being removed from the boot or shoe, so that the block cannot become lost, and no time will be wasted in looking for and sorting out the blocks of the lasts to be used.

IMPROVED WEIGHING SCALES.

Hosea Willard, Vergennes, Vt.—This invention is designed to improve the lever and beam scale for which letters patent have heretofore been granted to the same inventor under date of July 25, 1876, so that the construction of the same is simplified, and the gross or net weight taken in quick and perfect manner. This improved scale is used advantageously for weighing coal from boats, and other purposes, as the scale may be applied to the hoisting apparatus, and go with the bucket to the place of deposit, the indicator regulating the loading of the bucket, and determining thus the weight of a boat load with great facility, and without loss of time or labor.

IMPROVED BRIDLE ATTACHMENT.

Seton S. Cummings, Turner's Point, Tex., assignor of one third his right to Walker C. Stevenson, of same place.—This bridle is intended for training and taming horses; and it consists in the combination of brace and guide reins, neck and crupper straps, surcingle, and collar. A brace rein buckles into the bit rings, and runs through a ring attached to a strap that is secured to the neck strap, and thence it runs through a loop that is attached to the collar strap, and is finally secured to a ring that is attached to the surcingle by means of loops. The martingale is buckled into the bit rings, and passes through a loop in the front and lower part of the collar strap, and is fastened to the lower portion of the surcingle. All of the straps are duplicated, both sides being exactly alike; and they are provided with buckles or other convenient means for lengthening and shortening, to meet the requirements for horses of different sizes, and for the purpose of adjustment for different positions of the same animal.

IMPROVED CORSET.

Mrs. Maggie M. Harriman, Kansas City, Mo.—This improvement relates to the form and manner of cutting the first gores, to the shape of the sides of the body or waist of the corset, and to the conjunction of short bones with a quilted portion on the back of the corset, whereby it is rendered more elastic, easy, and durable in wear, and adapted for use as a dress waist.

IMPROVED APPARATUS FOR PICKLING SHEET IRON.

John D. Grey, Baltimore, Md.—The ordinary or old process of removing the oxide from sheet iron is to lay the sheets in a tank containing dilute sulphuric acid. They are placed vertical, or nearly so, with their sides in contact. By this improved apparatus, the sheets are conveyed slowly through the tank, upon endless chains, thus saving much labor in handling, lessening the time required for pickling, and enabling the acid to act upon the sheets more uniformly.

NEW MECHANICAL AND ENGINEERING INVENTIONS.

IMPROVED SAW-FILING MACHINE.

Samuel V. Pattillo, Greenville, Ala., assignor to himself and Frank J. Kohn, of same place.—This is an improved filing machine by which the gin saws may be quickly, uniformly, and effectively sharpened. The machine is operated by adjusting, first, the file vertically to one saw after the other by means of the center screw post and hand wheel, and filing the teeth of each saw at one side. The saw cylinder is next taken out of the centers and reversed, and the machine adjusted for left hand filing when the same operation of sharpening the teeth of each saw is performed as before, and thus a rapidly working and very effective filing machine for gin saws is obtained that accomplishes the work in better, speedier, and more uniform manner than by hand.

IMPROVED DYNAMO-ELECTRIC MACHINE.

Dieudonneé F. J. Lontin, Paris, France.—This invention consists, first, in combining a magneto-electric machine, in which the induced magnets are stationary and the inducing magnets movable, with a dynamo-electric device for producing currents invariable in direction, for the purpose of exciting the aforesaid magneto-electric machine; and, secondly, in increasing the length of cores of the stationary inducing electro-magnets of the device employed for producing currents invariable in direction, so as to permit one or more wires to be placed thereon, from which alternate currents in opposite directions may be taken, by which arrangement currents invariable in direction are obtained from the induced magnets of the wheel, and also alternate currents in opposite directions from the additional coils upon the lengthened inducing magnets, without the use of collectors or commutators.

IMPROVED WRENCH.

James Shepard, Angola, Ind.—This wrench is easily and quickly operated, as the turning of the handle moves both jaws, the same admitting to be opened wider, to be applicable to larger burs, while the length and leverage is increased jointly therewith. It has a handle with exterior and interior screw threads, that move jointly the jaws having intermeshing threads, the outer jaw being guided in an oblong recess of the inner jaw.

IMPROVED WINDMILL.

William T. Burrows, Nashua, Iowa.—The shaft of this wind wheel is so pivoted to the head of the tail vane that, in turning out of the wind under the influence of great force, the wheel will swing up an incline, whereby its own tendency to swing back down the incline is the means of keeping the wheel in the wind; and, in combination with a wheel in this arrangement, it is proposed to arrange a vertical vane behind the wheel on a pivoted bar, and connected to the vibrating wheel frame, to pull the wheel up the incline, in order that it will swing out of the wind more easily, and the lever of this vane will be weighted to regulate its action, to accommodate the wheel in so swinging out of the wind.

IMPROVED ORE FEEDER FOR QUARTZ MILLS.

George A. Church, Nevada City, Cal., assignor to himself and Edward L. Montgomery, of same place.—This is an improved device for feeding ore to the mortars in quartz mills, so constructed as to feed the ore to the mortar only as it is wanted, which will feed dry and wet ore with equal facility, which will not allow soft running stuff to run through and fill the mortar, and which will not impair the effect of the blow of the stamp by which it is operated.

IMPROVED RELIEF AND SAFETY STOP VALVE.

Charles P. Wiggins, St. Louis, Mo.—The object of this invention is to prevent accidents from carelessly closing the feed pipe while the pump is in motion, and it is so constructed as to always leave an open discharge. It consists in a relief or safety stop valve, formed of the shell provided with an inlet, two outlets, and two valve seats, and the double valve, so arranged that it can close only one outlet at a time, to adapt it to be interposed between the boiler and the check valve of the pump discharge pipe.

IMPROVED HOISTING MACHINE.

Daniel H. Merritt, Marquette, Mich.—This is an improved hoisting machine of considerable power, operated by a friction gearing at varying motion, and capable of being stopped at any moment, to support the load to be hoisted, by a superior brake arrangement; and it consists of a hoisting drum which is operated with friction wheels, and whose shaft is adjusted in parallel manner by eccentric sleeves with slotted arms, connecting rods, and a worm and toothed segment gear. The brake is applied by a similar gear to the other end of the drum, capable of adjustment to wear, being taken off by a brake shoe and supporting-arm at the lower end.

IMPROVED CAR COUPLING.

Benning Rowell, West Sparta, N. Y.—This invention is an improvement in the class of car couplings which are automatic in their operation. The improvement relates particularly to a device which acts as a trigger to support the coupling pin in position to engage the link when it enters the drawhead, and also serves to hold the link horizontal, or at any required angle in a vertical or horizontal plane, so that it will enter the drawhead of another car; also to a pawl lever whose function is to operate the coupling pin of the drawhead and to lock or hold the same in position when it has engaged the link.

IMPROVED TREADLE.

William B. Floyd, Kansas City, Mo.—This invention relates to an improvement in that class of sewing machines and other treadles that are worked by the alternating raising and lowering of the feet and legs in place of the forward or backward motion of the feet, so as to remove all strain from the ankles, and give the operator more power with less exertion than with the common treadle. It consists of two treadles, that are arranged in adjustable manner on the laterally swinging treadle bar, that turns by its crosspiece in suitable bearings. The treadles are pivoted longitudinally and laterally, to adapt themselves to the position of the feet. The compound pivots of the treadles renders the motion of the same natural and easy, so as not to fatigue the worker as much as where the feet and ankles alone do the work. The feet do not change their relative positions to the legs by the adjustment of the treadles to their position, so that there is no strain upon the ankle joints, but only upon the knee and thigh joints, which can perform more labor with greater ease, on account of their greater strength.

NEW WOODWORKING AND HOUSE AND CARRIAGE BUILDING INVENTIONS.

IMPROVED AUTOMATIC WAGON BRAKE.

Charles T. Warren, Atlanta, Ga.—This improved brake for vehicles is so constructed that it will be applied to the wheels by the operation of holding back, and at the same time will allow the vehicle to be backed without its being thrown into action. The construction is simple and ingenious, rendering the device excellently adapted to its purpose.

IMPROVED DUMPING WAGON.

Robert A. Reed, Hoboken, N. J.—This is an improved device for attachment to trucks, cars, wagons, carts, and other vehicles, to enable their loads to be readily dumped. By the construction, by turning the shaft in one direction the forward end of the body or box will be raised to dump the load; and by turning it in the other direction, the body or box will be drawn back into a horizontal position.

IMPROVED MITERING MACHINE.

Josiah H. Mosher and John Pennington, Pewamo, Mich.—This improved mitering machine is for use in the manufacture of picture frames, moulded frames, and for the cutting and putting together of frames on any desired angle and length. It consists of a basepiece with graduated guide rails, carrying sliding frame supports with adjustable saw guides secured thereto. The mouldings are first cut at the required miter, and then brought to a perfect joint by running the saw through the joint of the mouldings while they are firmly clamped together. They are then fastened by glue and nails, and thereby two corners of the frame connected in an easy, quick, and effective manner. The mitering and jointing of frames and mouldings is thus accomplished by a simple, accurate, and readily operated device.

IMPROVED SINK.

Benjamin Wallace, New York city.—This is an improvement on the sinks used in kitchens, tenement houses, etc., by which the rotting of the surrounding woodwork by the running or splashing over of the water is prevented, a more effective and readily changed strainer is obtained, and a tight joint between sink spout and conducting pipe, to avoid leakage, is formed. It consists of a sink with side and back guards extended above the horizontal flanges or seats.

IMPROVED CAR SCREEN.

William De Courcy May, Baltimore, Md.—This screen is shaped and folds like a lady's fan. It is attached to the side wall of the car, and may be extended and held open in a vertical plane, at right angles to said wall to prevent air currents from the open windows striking directly upon the passengers occupying the contiguous seats. The fan may be locked, by a catch, in the open or closed position, and constitutes a desirable as well as ornamental appendage of the car.

IMPROVED THILL COUPLING.

Benjamin P. Morrison, Abingdon, Va.—This thill coupling retains the shafts in strong and safe manner on the axle without a detachable bolt, avoids rattling, and allows the ready taking off and replacing of the shafts or poles when the vehicle is placed in the carriage house. It consists of a hook-shaped shaft head, that is locked to a cross bolt, with central flat eccentric part swinging in the ears of the axle clip and entering the recess of its shaft head. The hook-shaped end of the shaft head is first introduced into the ears of the clip while the front end of shaft is resting on the ground, and the flange of cross bolt hanging down. The shaft is then raised as nearly as possible to the perpendicular, so that the shaft head may pass down between ears far enough for the flange of bolt to be swung into the opening or recess in shaft head. The shaft is then lifted in upward direction until the bottom or rear part of recess is brought in contact with flange of bolt, when the shaft may be swung down to the ground. A thin strip of leather is interposed between the flange of bolt and shaft head to form a tight fitting of the parts, and prevent rattling. The shaft cannot become detached when in use, has no nuts to work off or bolts to be taken off in attaching and detaching, and forms a simple and effective device for quickly taking off and applying the shafts or poles.

IMPROVED COMBINED FREIGHT AND STOCK CAR.

Jones R. Maitland, Hot Springs, Ark.—This consists of a freight car, with jointly-sliding upper and lower sections, that either close or open the upper and lower openings of the car. The upper sections are guided by friction rollers on strips, and are moved in division casings with inclined bottom rails, having suitable openings for the shedding of the entering rain. When stock is transported, the sections are thrown open and locked by spring bolts. When freight is to be shipped, the sections are closed in similar manner, providing thus a stock or freight car, as required by the service of the road.

IMPROVED CENTER-DRAFT SIDE THILL.

Conrad H. Matthiessen, Odell, Ill.—The object of this invention is to construct wagons provided with side thills in such a way that there may be no side draft; and it consists in the combination of a lever, wire rope, keeper, pulley, wire rope or rod, and spring, with a side thill, whiffletree, and running gear of a wagon. The effect of the arrangement is to take the draft from the rear axle, the pole being merely used for holdback and steerage purposes. The vehicle is thus made to run more steady, with better guidance, and less side draft.

NEW AGRICULTURAL INVENTIONS.

IMPROVED CORN PLANTER.

George Tatlock and Stanford Newby, New Philadelphia, Ind.—This is an improved machine for planting corn, which opens a furrow to receive the seed, drops the seed at regular distances apart, and covers it, and is so constructed that the planting device can be detached and the rest of the machine used as a plow or cultivator, by detaching the side bars, the wheel the dropping cylinder, and the hopper, and bolting the forward ends of the handles to the plow beam. The seed is received from a dropping cylinder and conducted to the ground by a spout, which passes down through holes in the beam and standard.

IMPROVED ANIMAL POKE.

Benjamin D. Watson, Durant, Miss., assignor to himself and James C. Watson, of same place.—The object of this invention is to provide a yoke that shall prevent animals from jumping over or destroying fences. A saddle is concaved to fit the under side of the body of the horse, and secured in place by a strap that passes over the horse's back. A mortise is made in the saddle to receive an arm which is provided with a slot. A pin passes through the saddle and through the slot. The arm is provided with a point and a perforated spring, the latter acting as a guard for the said point. Another arm is jointed to the arm already mentioned, and is capable of being raised into a horizontal position, but is prevented from rising further by the shoulders of the joint. The former arm is placed between the front legs of the horse, and the latter is connected with a headstall by a strap. When the horse attempts to jump, the raising of the head or striking the second arm into the fence or other object presses the point through the aperture of the spring into the chest of the horse.

IMPROVED SEED PLANTER.

Harvey J. Robinson, Carpenteria, Cal.—This is an improved machine for planting potatoes, corn, and other seeds, so constructed as to plant the seed so deep as to be beneath the dry soil so that it may have sufficient moisture to make it grow, which will prevent the moist and dry soil from becoming mixed, and which will cut off any weeds that may be growing upon the land being or to be planted.

IMPROVED HORSE HAY FORK.

Peter Grant, Clinton, Ontario, assignor to himself and John R. Grant, Brussels, Canada.—This fork is to be used for loading and unloading hay and other similar substances by means of horse power. It consists of a central tubular tine and lateral tines. A tubular plunger fits into the central tine, and is provided at its upper end with an eye or hook, and is plugged at its lower end, and provided with ears, between which barbs are pivoted. A spring is clamped to the tine by a band and screw, and is provided with a catch pin, which passes through a disengaging lever and side of the central tine into a hole in the plunger. The lever rests under the spring, and is held in place by the catch pin. The free end of this lever is bent upward, and provided with a small pulley. A key passes through a mortise in the central tine and through a slot in the plunger, for limiting the motion of the said plunger. The end of the key is bent over the front of the central tine, and is formed into an eye for attaching the disengaging cord which runs over the pulley.

IMPROVED PLOW.

John Preston, Millford, Ky.—This plow is intended to be used for laying off or marking land, and for making hills for tobacco, cabbages, and other kinds of plants to be transplanted, for covering corn, and as a shovel plow. It consists in the combination of a curved beam, provided with a plow plate and a rigid perforated bar, a slotted beam, a standard, provided with the square plow and the roller, and handles. In using the plow for preparing the ground for transplanting plants, the shovel plow opens a furrow, along which the square plow follows, pushing the loose soil before it. At the point where each plant is to be set out the plow handles are raised, which causes the square plow to leave and pass over the soil collected before it. As the square plow is again dropped to the ground, the roller presses upon the little heap of soil left by the square plow and flattens and smooths it, ready to receive the plants. For covering seed, the beam is detached, the square plow is drawn along the furrow, and is raised by the handles at each hill. To adjust the machine for use as a shovel plow, the beam and the square plow are detached, and the shovel plow plate is attached to the standard.

IMPROVED CLEARING ATTACHMENT FOR PLOWS.

Jonathan F. Dock, Elkhart, Ind.—This invention consists of a frame bolted to the plow beam, and carrying a serrated roller, that revolves on a vertical axis above the upper edge of the plowshare, and a jointed hook, that projects diagonally from the said frame, for drawing stubble, weeds, etc., into the furrow as it is turned. The frame is secured to the plow beam by a bolt that passes through a slotted arm projecting from the frame. The advancing end of the lower portion of the frame is pointed, so that it may readily pass through stubble and weeds. The roller is grooved spirally in opposite directions, forming diamond-shaped projections, which engage with the surface of the earth as it is turned up by the plowshare, and insure its rotation. This roller assists in turning the furrow, and also rolls the weeds under. The hook is drawn along upon the surface of the ground, and draws in the stubble and weeds as the furrow is turned. The spring permits it to follow the inequalities of the ground.

IMPROVED SCYTHE SNATH FASTENING.

Miles Smith, Springfield, Vt.—This invention is an improvement upon the patent granted the same inventor January 16, 1877, for a similar invention, in which the tang or toe of the scythe blade was contained in a socket plate arranged to swing so as to give the desired adjustment to the scythe blade, and which socket plate was held to its adjustment by a screw bolt. The object of the present improvement is to provide means for more rigidly holding the socket plate and the scythe blade in their corresponding adjustments, to which end it consists in roughening the under surface of the free end of the socket plate, and combining it with a plate upon the snath having a corresponding roughened upper surface, which plate operates both as a bearing for the clamping bolt and a clutch plate for the swinging socket to hold the latter in rigid position when the clamping bolt is screwed up.

IMPROVED COTTON PICKER.

Orren R. Smith, Raleigh, N. C.—The chief feature of this invention consists of two or more series of pickers formed of flexible spines or toothed rods depending vertically from pivoted bars arranged horizontally, but vibrating in vertical planes, successively. The said pickers strip the cotton from the balls and by their inter-action carry it up and deliver it to a carrier, by which it is conveyed to a receptacle in rear of the pickers.

IMPROVED DITCHING MACHINE.

Silvanus P. Evans, Ash Ridge, O.—This invention consists in providing a ditching machine with an apparatus whereby the shoe which bears the coulter may be quickly and readily lowered or raised, as it is desired, to cut the ditch or trench deeper or shallower. It also consists in extending up from the coulter an inclined plane or mouldboard, the upper edge of which projects over a trough or gutter bearing an endless band moved by side chains and end rollers, so that the slice of earth cut by the coulter and side knives of the machine may be broken up in its fall from said mouldboard and more easily delivered to the chute at the rear of the machine.

NEW TEXTILE INVENTION.

IMPROVED LOOM SHUTTLE.

Ezra W. Marble, Wilkinsonville, Mass.—This improved shuttle is so constructed that the cop may be placed upon the spindle without having its interior snarled, as is the case when the ordinary spindle is used, thus avoiding the great waste of cotton from the snarling. The spindle is held in place by a lever that supports the heel of spindle with an oval end, while it is itself supported at the other end by a spiral spring. The oval end of lever is designed to help in closing up the spindle when raised at the point out of the shuttle box to receive the cop. The socket for the end of spindle is made to fit a round hole with a side groove at the bottom, to accommodate each of its ears. It is inserted within the shuttle by placing the ears lengthwise of the slot that is intended to receive the spindle, and, after being pressed down to bottom of hole, turned around to let the ears into the side groove.

NEW HOUSEHOLD INVENTIONS.

IMPROVED FOLDING CHAIR.

Ernest Smith, London, England.—This folding chair may be easily folded and unfolded, may be adjusted into various positions for use, may be compactly folded for storage or transportation, and forms an easy and comfortable resting place however it may be adjusted. The invention consists in pins, hooks, holes, and pins for connecting the rear legs with the forward legs of the chair frame, and in the chair frame formed of the front legs, the rear legs, the seat bars, and the jointed arms, and their rounds or cross bars, constructed and combined with each other.

Notes & Queries

J. S. will find directions for making lard oil on p. 283, vol. 30.—H. C. W. should read our articles on the management of boilers on p. 293, vol. 36. As to testing boilers, see p. 246, vol. 34.—W. E. can plate brass, etc., with nickel by the process described on p. 235, vol. 33.—O. E. will find directions for making oil of peppermint on p. 219, vol. 31.—E. O. T. will find an excellent recipe for cement for mending roofs on p. 187, vol. 35.—J. B. will find a recipe for tough glue on p. 43, vol. 32.—D. A. G. will find directions for making impression paper on p. 378, vol. 28.—T. S. L. can remove paint spots from glass by following the directions on p. 235, vol. 36.—J. T. S. will find a description of the Gatling gun on p. 143, vol. 26.—A. C. will find a description of an hydraulic press on p. 315, vol. 35.—A. H. D. will find a description of the nitrate of silver process of making mirrors on p. 267, vol. 31.—D. S. M. will find directions for kalsomining on p. 351, vol. 24.—P. A. N. does not send sufficient data.—R. F. I. will find directions for building an ice house on p. 251, vol. 31.—E. B., C. F. Q., J. W. B. N. C., G. P., R. K. B., J. F. P., W. H., J. P., and others, who ask us to recommend books on industrial and scientific subjects, should address the booksellers who advertise in our columns, all of whom are trustworthy firms, for catalogues.

(1) O. C. K., of Leipsic, Germany, says: To make lead pipes nearly harmless, as regards the poisonous properties of the lead salts soluble in water, fill the pipes for a short time with dilute sulphuric acid (SO_4H_2+10 or 20 H_2O). The pipes will become covered with a thin coating of sulphate of lead (SO_4Pb), which is far more insoluble in water than the oxyhydrate of lead (Pb OH_2) generally formed.

(2) A. G. says: I have a rough chamois skin leather bag, into which, by some mistake or other, there came some English vermilion, dry. How could I clean it out? A. Vermilion is a compound of mercury with sulphur, and there is no solvent for it that would not damage the materials of the bag. Remove as much of it as you can with a stiff brush, and then cause an energetic stream of water to impinge upon the discolored surface, so as to mechanically carry off the particles of the pigment.

(3) G. B. S. asks: 1. Will tin (old cans, etc.), copperplated, do for the coppers in a gravity battery? A. Yes. 2. Will salt (sodium chloride) do for the saline substance? A. Better use sulphate of zinc. 3. Will common plate (window) glass do for the plate in an electric machine? A. Yes, but it is not the very best.

(4) W. M. M. says: I have a magic lantern, and want to know what kind of oil gives the best light for it. A. Kerosene gives as good a light as any, and better than most others.

(5) C. M. asks: What can be applied as a depilatory on horses, destroying the pigmentary granules yet not destroying the life of the hair? The object in view is to brand colored horses with a white brand. A. This is not practicable. The color of the hair above the cuticle may be bleached by the application of chlorine water or nitro-muriatic acid (*aqua regia*). It is not probable, however, that the action of these will be rapid enough for your purpose.

(6) C. E. H. says: Four years ago I had in a mill an upright shaft of eight inches diameter which, with attached gearing, weighed several thousand pounds. The toe on which it turned commenced cutting badly. It was impossible to remove the toe. Washers of steel raised the shaft too high out of the step, wore out rapidly, and did not work thoroughly well. I went to a number of machine shops for advice. One told me to grind it out with emery; another said my only course was to take down the shaft and send it by rail to the shop, and none could give me any speedy and economical cure for the trouble. At length I met the right man, who told me to raise the shaft and put under the toe (in the step) an old-fashioned large-sized copper cent. This I did, and the heating and cutting ceased at once, and the difficulty was permanently overcome. Since then I have put small cents in the steps of millstone spindles and always with good effect. The grooves filled up with the copper, and the toe looked as though it were copperplated and burnished. I even got to introducing a small copper cent under each new spindle, and think that so doing prevented cutting.

(7) A. J. F. asks: How can I set the lenses of an eyepiece to a telescope? It is composed of two plano-convex lenses. A. The Huyghenian eye lens is one third the focus of the field lens, and is placed its own focal length with the focus of the latter.

(8) A. L. S. says: I learn from tables on the heat of water with steam, that 60 lbs. pressure equals 292·6° Fah. Is this the degree of heat under any and all circumstances? A. This is for fresh water. The temperature changes, if the water contains impurities.

(9) G. W. K. says: I have tan vats which have not been used for some time. I keep them full of water to preserve them. How shall I keep mosquitoes from breeding in them? A. Cover them tightly.

(10) E. C. H. says: I wish to fill up a low place in a lot with a mixture of sand and gravel. How much will it settle after leveling it off 1 foot deep with no packing? Surface of plot is a rich loam, subsoil a clay bottom. A. From ¼ to ⅓.

What is the thinnest circular saw I can use 10 inches in diameter for sawing 2 inch white oak, saw running on 700 revolutions per minute with 2 horse power? A. One of No. 16 gauge, or about $\frac{1}{16}$ of an inch thick.

(11) I. says: Nearly all lugs or supports riveted to steam boilers have three on each side, one of them in the middle of the boiler; so, if either end of the support settles, the whole weight of the boiler of water is hung by the middle. This is all wrong. There should be either two or four supports on each side of the boiler, the longest space between the two inside ones. Is not this so? A. Yes. We could not tell you why the former course is pursued, except that common sense is scarce.

Why is it that persons at this period of mechanical science place tightening pulleys on the load line or pulling side of a belt? A. We do not know, but we are glad to call attention to these points again, as we have frequently done before.

(12) G. H. A. says: I sometimes preserve eggs in limewater, and they keep well, but look limy after taking out of the solution, notwithstanding that I let the lime settle in the water till it looks clear, and dip it out, leaving the lime behind. Is there anything that I can put in to remove what little lime stays in the water? A. We think filtering will answer the purpose. Place a piece of filtering paper in a funnel, and pour in the liquid.

(13) C. S. O. asks: 1. Has the compound engine any advantage or economy other than shortness of stroke over a single cylinder sufficiently long to secure an equal amount of expansion? A. It is claimed that the machinery can be made lighter, with the compound engine, for high grades of expansion. 2. Will highly volatile liquids give more power than water in an engine, from the same fuel? A. Not necessarily.

(14) G. S. C. asks: Could not hot air balloons be used for aerial navigation, if a light furnace were constructed which would constantly run a hot current into the balloon? A. It would be difficult to carry enough fuel for an extended voyage. Fire balloons have been used successfully for short trips.

(15) A. S. E. says: The centrifugal force on the sea board and that on the top of the highest mountain is considerable. The specific gravity is the same. Let a globe be turned rapidly, and water put on; it climbs to its greatest diameter, and flies off. Two canals are cut at the same declivity, one north and the other south; the velocity is the same in both. Neither does this influence affect the wind. Please explain the law that counteracts this influence and produces the equilibrium? A. There is a slight difference in the effect of gravity at the different levels.

(16) C. G. V. P. says: Is it practicable to heat the passenger cars with the steam from the locomotive? If so, in what manner is the steam conducted from the boiler? It seems to be a failure in Europe, and some of my European friends ask me what the SCIENTIFIC AMERICAN thinks about it. A. It might be possible, but it would be necessary to increase the size and weight of locomotives. Steam pipes could be arranged in a similar manner to the air pipes used with continuous brakes.

(17) M. W. H. says: How many lbs. pressure can an ordinary horse exert, when doing its best? A. Between 300 and 400.

1. What is a high pressure engine and boiler? Is it not one that condenses its steam, and uses the water over again? A. In the common acceptation of the term, a high pressure engine is non-condensing. 2. What steam pressure will a vat sustain, if made of 2 inch plank of oak, matched, and covered with heavy sheet iron, both out and inside? It is 3 feet in diameter and 10 feet high? A. Your data are insufficient.

1. How can phosphorus be made into solution for using on gun sights after night and other similar purposes? I dissolved some in hot olive oil, also in turpentine, but it settled and formed a hard body as soon as cooled, in both. What is the trouble? A. Probably the ingredients were not pure. 2. What is the coldest temperature in which phosphorus will glow or show light? A. About 32° Fah.

(18) F. R. H. says: I have an iron tank 4 feet in diameter by 12 feet long, in which I put dead stock to be steamed out. This tank is supplied with steam from a portable boiler and engine. The steam dome is 1 foot high, and the pipe rises from the dome 1½ feet in three turns, and goes 6 feet down into the tank in the bottom. When I turn on the steam to the tank the water blows from the boiler faster than I can pump it into the boiler, at the same time running the steam down. It has only begun acting so lately. Can you tell me how I can overcome this difficulty? A. It is not unlikely that your pump is out of order. You can regulate the amount of steam let into the tank, so that the pump will supply what is taken away.

(19) W. F. A. says: I have tried to bend basswood, but have failed. I gave it a long steaming, and it would break off short. Then I tried a short steaming, but it worked in the same way. Can you give me some information? A. It is very possible that the specimens you tried were not suitable. It may be that any kind of wood can be bent at pleasure, by a proper treatment, but the methods are not generally known. There is now for sale in this country bent-wood furniture, which is, we believe, manufactured abroad by a secret process.

(20) A. B. says: I saw in the SCIENTIFIC AMERICAN, of January 20, an engraving of a new water velocipede. Please tell me if the two floats would be better if they were of the shape of a triangle, and what should be the distance between the floats? How long, from end to end, and of what size should the paddle wheel be? What should be the thickness of the floats, and what would be the best material to make them, in case of stones or rocks in the river? A. We think the cigar shape is best for the floats. Their size depends on the load to be carried, and must be calculated for any particular case. Distance apart, 2 to 4 feet, according to capacity, will do. They could be made of light iron, for clearwater, and of wood for rocky places.

(21) F. W. B. asks: What power can I use to run a dental engine and a small polishing lathe head? I have tried water motors, but they fail. A. We think there are water motors in the market that will answer. There are also small steam and electric engines suitable for the purpose.

(22) S. N. M. says: 1. I read that the earth's rotation is retarded 22 seconds a century=0·22 seconds a year. Also that two thousand million years ago, the earth was rotating twice as fast as now. I figure thus: Earth now rotates in 86164·09 seconds, and $\frac{86164 \cdot 09}{2 \times 0 \cdot 22}$ = 195,827 years ago earth rotated twice as fast as now. Am I wrong? I also find the following: "It therefore follows that she was rotating at about the same rapidity as now, when she became solid; and as the rate of rotation is certainly diminishing, the epoch of solidification cannot be more than ten or twelve millions of years ago." How can this be? A. Your calculation does not seem to be correct. The assumption is for 0·22 seconds a year at present. We presume the article gives reasons for the second statement, which is not very alarming to the present generation, even if true.

(23) W. C. W. asks: How will a cast iron vertical boiler, 3 feet high and 15 inches in diameter, shell being ½ inch thick, with flat heads ¾ inch thick, and firebox in base of boiler, with 15 tubes, as compared with a wrought iron one of similar form? A. We think the wrought iron boiler is preferable on many accounts, and advise you not to use cast iron.

(24) W. H. P. asks: Will it require less heat to boil away 100 gallons water in vacuo than under atmospheric pressure? Would there be a decided gain in the expense of fuel in thus evaporating water? A. The amount of heat required would be a few per cent less in the case of the vacuum.

(25) A. B. says: 1. We intend to put a siphon to draw the water from a part of mines, the height to which the water has to be lifted perpendicularly is 20 feet from the summit. There is 600 feet of tunnel with a grade towards the other end of 6 inches to the 100 feet. We can extend the pipes to a depth of 35 feet, so that the discharging end will be 18 feet below the suction end. Length of pipe in all will be 700 feet. Will it work? A. It will be necessary to have an air valve at the highest point, which must be opened occasionally or may be made automatic. 2. We intend to use 3 inch gas pipe for the siphon, but the present supply of water will probably run through a 1½ inch pipe, and the water will increase in quantity. Can we regulate the siphon so that the present supply of water will run in a continual stream through the 3 inch pipe by putting a stopcock on the discharging end and keeping it open ¼ or ⅓ of the time—as the supply of water varies? A. Yes.

(26) A. A. H. asks: How can I remove ink stains from fabrics, fingers, and paper without injuring the article stained? A. To remove ordinary ink (tanno-gallate of iron) stains, the following treatment is recommended: In many cases lemon juice will often prove efficacious. If this fails, try an aqueous solution of oxalic acid (1 part to 2 parts water) and rub well with a soft cloth. Or use a solution of chloride of tin (1 part to 3 parts water, or pure dilute muriatic acid (1 part to 10 parts water). Apply with a camel's hair brush, and then wash in cold water. Where the colors of the fabric are affected by the above treatment, moisten the spots with fresh milk and cover with fine salt. This should be done before washing. If the fabric is fine and delicate, the stained portions may be dipped in melted tallow and then pressed for some time between layers of warm pipeclay. Stains of indelible ink (made from nitrate of silver) may be removed by moistening them with a brush dipped in a strong aqueous solution of cyanide of potassium, and then well washing the fabric in water. The cyanide solution is very poisonous.

How can I gild book covers, picture frames, etc.? A. Fine gold leaf is used for ornamenting books. It is stamped in the covers by a press. On gilt picture frames gold leaf is also used, but in many instances the gold-like finish on these frames is produced by laying on first silver leaf, and then lacquering this with an alcoholic solution of orange shellac, to which is often added gum sandarac and dragon's blood, saffron, gamboge, etc.

(27) J. W. S. says: Can you give me a good formula for making a fluid extract of annotto? A. Annotto is often adulterated with flour, soap, Venetian red, and red lead. Macerate it with twice its weight of alcohol for several hours and filter.

Please tell me how to make a good stencil ink, which contains no oily matter and will dry quickly? A. Rub up a quantity of lampblack in a mortar with enough of a strong, hot solution of dextrin in water to form a paste, and add a little alum water. Solution of soap is sometimes used in place of the dextrin and water.

(28) J. R. K. asks: By what process can I remove the silver from old mirror backs, so that it can be used again? A. If it is silvered, use nitric acid, and crystallize from the solution by evaporation in a small porcelain vessel. If the coating is an amalgam of tin and mercury, use mercury, and loosen the film by rubbing with a cloth.

I have some walnut furniture finished in shellac. It got wet in moving; and wherever the water touched it, it left a white spot. How can I remedy this? A. Rub the spots with a little oil mixed with Venice turpentine.

Is arsenite of copper called Paris green? A. No. Arsenite of copper is known as Scheele's green; Paris green is an aceto-arsenite of copper.

(29) G. J. H. asks: Is there any way to separate tin and copper which have been melted together, so that the copper can be used again? A. Most of the tin may be burned out by prolonged exposure to the air at a high temperature. This is the only practical method we know of. Small quantities of the alloy may be dissevered by dissolving it in a slight excess of strong nitric acid. The insoluble oxide of tin will then settle to bottom of the vessel, when the copper solution may be decanted and the copper precipitated out as oxide with an excess of potassa, soda, or lime. This precipitate may be reconverted into metallic copper by first drying it thoroughly, and then mixing it in a crucible with powdered charcoal, and exposing to a high temperature. The tin may be recovered in a similar way.

(30) W. B. M. says: I want to build a tank 48 inches deep by 48 inches wide by 36 inches long, for boiling linseed oil with steam. What amount of pipe will be required to dissolve the manganese used in boiling that amount of oil? A. This can best be determined by experiment. It may require 150 to 200 feet of inch pipe, but this, of course, is dependent on the temperature attained and the length of time allowed for the operation. There are no accurate data on the subject.

(31) W. B. asks: Is there any possible way to get the turpentine taste out of rosin? A. Pulverize the rosin and boil it for some time with a quantity of water; then dry, and fuse it.

(32) O. E. says: I will advise R. L. D., who asks how to harden an eggshell, to lay the egg in vinegar for two weeks. The shell becomes soft, and you can stretch it like a piece of rubber. Lay it in a strong solution of saltpeter for two weeks, and then you cannot strike it to pieces with a hammer.

(33) A. J. J. asks: How can I make an indelible mixture of nitrate of silver, using oil? A. You may make an emulsion of the nitrate in the oil by rubbing them up together in a mortar. It is better to use glycerin instead of oil. Mordant with a strong solution of carbonate of soda.

(34) H. E. W. asks: 1. In the manufacture of electric annunciators, will malleable iron castings answer as well for frames for the magnets, etc., as brass castings? A. Yes. 2. If the magnet cores are screwed

directly to the malleable iron frame, without a connecting piece of iron, will it answer as well, the malleable iron acting as the connecting piece? A. Yes. Which is cheaper, to cast small articles in brass, or to cut them with dies? A. Castings will probably be found cheaper.

(35) W. P. E. asks: 1. Have you any knowledge of a speed of 25,000 revolutions per minute having been obtained by a single motion, without gearing of any kind? A. We do not remember having seen or heard of such a device. 2. Could such a speed be advantageously applied, for instance in blowing a steam fog horn for the Signal Service, or for other purposes, provided the machine giving the motion was not too expensive? A. It might be usefully applied to numerous cases, if cheap, simple, and powerful.

(36) A. M. W. says, in reply to D. W.'s query as to his singular phenomenon: This does not appear to me at all singular. It is very evident that the bearing, or step, had become dry. It is a common occurrence, where steel runs in or on steel, that the bearing will, if allowed to get dry, become heated to such a degree that the temper is lost, and the surfaces get to cutting and almost weld together. The statement that the plate was bent by the hammer shows that the plate was soft then, even if it had once been hardened. D. W. says that sufficient oil was found above the plate collar, but he does not say that there was oil on the plate where it was most needed. In my experience, I have never known hardened steel to cut or grind together when properly lubricated, and I think it impossible to produce that effect except by a pressure that would expel every particle of the lubricant. Two hardened steel surfaces may be ground together when dry without losing the temper; but they would not adhere with the tenacity that D. W. describes. It is possible that the time taken to raise both stones gave the spindle and plate opportunity to give off the heat to the cast foot and bed. In my opinion, the construction of the oval end spindle would have a tendency to run dry even under common lubrication, as it would only bear on a small part of the end, which might, with the weight of the stone, force it dry. Hardened steel bearings do not often give any notice of being dry, except by refusing to do duty, a very few revolutions being sufficient to announce the fact and ruin the bearing. I would suggest to D. W. that he make his spindle so that its end rests its whole surface on the step with a hole in the latter opposite the center of the spindle. The spindle should be made like a cup, so as to form a reservoir for the oil, and so deep that the end of the spindle shall be immersed.

(37) J. S. B. says: I have found a specimen of tantalite. Can you tell me anything about this rare mineral? It is said to consist of tantalic acid and iron, and is valuable, especially when found in crystallized forms. May we expect to find it in veins or beds, or on high or low lands? A. Tantalite is Fe O, Mn O, TaO_5, with sometimes oxide of tin replacing part of the ferrous oxide. Some specimens are nearly destitute of manganese and some contain oxide of copper and lime. Its luster is nearly pure metallic, somewhat adamantine; its color is iron black, and streak reddish brown to black. It is opaque and brittle, and its hardness varies from 6 to 6·5. Its specific gravity is from 7 to 8. It is confined mostly to albite or oligoclase granite, and is usually associated with beryl. It is also found associated with gigantolite in albitic granite, and with lepidolite, black tourmaline, and colorless beryl. The name is usually extended to the American mineral columbite, the average analysis of which gives Si O_2 (80·60), Fe O (15·57), Mn O (5·0), Sn O_2 (a trace).

(38) T. McC. says: 1. I am building a small horizontal steam engine, with 2 inches bore and 4 inches stroke. What size of boiler would I need for it, and what should be the thickness of the iron? A. Make it 15 inches in diameter, 24 inches high, of 1/8 inch iron, for 60 lbs. pressure. 2. What would be the best speed to run it at in order to get the most power? A. You may run it at 250 revolutions a minute. 3. Could I make a cylinder of an engine with 2 inches bore and 4 inches stroke with Babbitt metal, that would stand the steam pressure as well as brass or iron? A. No.

(39) H. P. S. says, in reply to A. B.'s questions as to the violin: There are two or three different tools with which the grooves are cut. One of the best I ever used or saw, I constructed myself; but it cannot well be described in a limited space or without illustrations. With it a perfect groove can be cut around a violin plate in half an hour. A perfect groove cannot be made without a tool well adapted to the purpose. The threads mentioned by A. B. are known as purfling, and consist of a thin slip of white holly wood between two similar slips of ebony, and are glued into the groove before the plate receives its final finish. Staining is, in most cases, done upon the wood, with thin, transparent dyes of different composition, and varnish laid on over that in the ordinary manner; but the technicalities of this portion of the subject are too numerous for treatment in brief space. See Business and Personal column of this issue.

(40) D. H. M. says, in reply to D. W.'s query as to the welding of his mill spindle: I suggest that the mill had been in use long enough to wear the lower end of the spindle to such a nice fit on the step that no oil could get under it, which caused friction sufficient to produce heat enough to weld it, and as it was done suddenly, the heat did not extend far in either direction, and the cold metal in connection with it soon cooled it down again. While the oil that it was covered with answered in the place of borax or other welding preparation, and at the same time excluded the atmosphere so that no change of color of the heated parts took place. I have seen a hardened steel gudgeon that was in the lower end of a water wheel shaft welded to the step when it was three feet under water. The force of the wheel twisted it off a little above where it was welded; and when it was taken out the piece could not be knocked off the step with a sledge hammer.

(41) R. L. C. says, in reply to D. W.'s query as to the millstone spindle and step: I have repaired two mill spindles that have had their points ground or welded to the steel plates upon which they run. In one case the steel point was 1½ inches in diameter, and projected from the spindle (which was 4 inches in diameter) about 3½ inches. It was twisted off about 1½ inches from the end, and the parts were to all appearance thoroughly welded together. In the second case, the point was of about the same dimensions as the first; but instead of twisting the point off, it turned in the spindle (which of course cut it badly), where it stuck to the plate. After considerable hammering, they were broken apart, but not where they were welded, as part of the plate came away with the point when they separated. I account for it in this way: As long as two metal surfaces that are intended to run together are properly lubricated, we have no grinding or welding if they are proportioned to the work they have to do. In the above cases, the person in charge of them said there was plenty of oil in the pots. It often happens that the passage ways get stopped up and the oil fails to reach the parts, and the result is that they grind together almost instantly.

(42) M. D. L. says: We desire to manufacture for our own use in large quantities, carbon plates for batteries, and carbons for electric lamps, of larger size and greater length than we can find in the market. What mixture of materials secures best results? What degree of compression is required? How is compression applied? Should the mixture be heated while under compression? What kind of mould is used? How can we prevent the carbon from adhering to sides of mould? A. In his work on "Electricity and the Electric Telegraph," Prescott says: "The fine dust of coke and coking coal is first put into a close iron mould of the shape required for the carbon and exposed to the heat of the furnace. When taken out, the burned mass is porous and unfit for use, but by repeatedly soaking it in thick syrup of gas tar and reheating it, it at length acquires the necessary solidity and conducting power.

(43) R. J. J. asks: How can I make a galvanic machine for giving shocks from the wire of the telegraph sounder? A. You can get a pretty strong shock from an ordinary telegraph relay, if you have one, and do not want to incur the expense of a special apparatus. The connections are made in the following manner: The relay is joined up in circuit with a battery and mechanical vibrator for interrupting the circuit, and two wires with handles, to be held when taking the shock, are connected to the binding screws of the relay's helices, one wire to each screw.

(44) H. A. H. says: I have a glass jar, about two feet of insulated wire, some blue vitriol and some sulphate of zinc. Please tell me what more I want to make a battery with? A. Get a copper plate, attach the wire to it, and place it on the bottom of the jar with the wire sticking out. Fill the jar about two thirds full with a weak solution of sulphate of zinc and water, and suspend a zinc casting, provided with a terminal wire, from the top of the jar; let the zinc just dip below the surface of the solution. Now drop a few crystals of blue vitriol on the copper plate and join the wires for a short time, when the battery will be ready for action.

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

Will J. M. P. send us a specimen of the residue from his limestone water?—G. S. A.—The piece of rock contains titaniferous iron. It would require a quantitative analysis to determine all of the other constituents. It also contains a little arkansite—titanic acid. The pieces of metal consist apparently of the iron from your ladle, together with some titanic acid.—J. Z.—So far as we can discover, the segar contains only very strong tobacco. The odor is due to certain essential oils peculiar to tobacco, and cannot well be imitated.—G. H. P.—It is a variety of mica called muscovite, consisting of potash, alumina, and silicic acid. It is not valuable.—B. F. C.—It consists principally of carbonate of soda. We do not see that it would be likely to prove very efficacious as a scale preventive. It will not injure the iron.—We have received some minerals in a small pasteboard box without a name on it. No. 1 is chlorite, composed of oxide of iron, magnesia, alumina, and silica. No. 2 is chondrodite—a silicate and fluoride of magnesium. No. 3 is spinel—magnesia and alumina.

D. F. H. asks: How is the tubing of brass band instruments formed, and how are the dents removed from the same?—D. S. says: I have made a few wooden organ pipes, but they do not give more than a whistling sound. Can any one give me the proportions for a middle C?

COMMUNICATIONS RECEIVED.

The Editor of the SCIENTIFIC AMERICAN acknowledges, with much pleasure, the receipt of original papers and contributions upon the following subjects:

On Spiral Springs. By J. T. G.
On Man's History. By J. E. W.
On Mechanical Science. By E. B.
On Kerosene Oil for the Hair. By G. H. S.
On the Origin of Solar Light. By G. P. H.
On Canceling Postage Stamps. By H. D. M.

Also inquiries and answers from the following:

H. P. G.—S.—T. A.—G. H.—W. B.—P. M. G.—J. M.—X. Y. Z.—J. D. H.—W. W.—F. C.—H. R.—G. McC.

HINTS TO CORRESPONDENTS.

Correspondents whose inquiries fail to appear should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them. The address of the writer should always be given.

Inquiries relating to patents, or to the patentability of inventions, assignments, etc., will not be published here. All such questions, when initials only are given, are thrown into the waste basket, as it would fill half of our paper to print them all; but we generally take pleasure in answering briefly by mail, if the writer's address is given.

Hundreds of inquiries analogous to the following are sent: "Who sells square lenses for magic lanterns? Who sells telegraph instruments for learners? Whose is the best theodolite? Who sells the best aniline dyes? Why do not makers of steam plows advertise in the SCIENTIFIC AMERICAN?" All such personal inquiries are printed, as will be observed, in the column of "Business and Personal," which is specially set apart for that purpose, subject to the charge mentioned at the head of that column. Almost any desired information can in this way be expeditiously obtained.

OFFICIAL.

INDEX OF INVENTIONS

FOR WHICH

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

April 10, 1877,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

A complete copy of any patent in the annexed list, including both the specifications and drawings, will be furnished from this office for one dollar. In ordering, please state the number and date of the patent desired, and remit to Munn & Co., 37 Park Row, New York city.

Amalgamating ores, Laflin & Elliott 189,313
Animal trap, M. Early 189,346
Anti-friction bearing, O. R. Chaplin 189,427
Anvil, blacksmith's, H. B. Sevey 189,393
Axle box, D. Dalzell 189,434
Bale band tightener, J. L. Sheppard 189,325
Bale ties, etc., cutting, J. R. Tobin 189,524
Barrels, etc., lining, M. Laflin 189,312
Barrels compressing, O. D. Goodell 189,309
Bed bottom, spring, F. B. Franklin (r) 7,597
Bed bottom, spring, J. H. Palmer 189,382
Bedstead, wardrobe, M. Crosby 189,303
Beer, ale, etc., cooler for, F. V. Baudelot 189,331
Beer cooler, F. V. Baudelot 189,332
Belt fastener, P. Lyons 189,478
Bench plane, L. Bailey 189,415
Bench plane, G. Gocher 189,453
Bevel, J. F. Klinglesmith 189,311
Blackboard, Kinsley & Packard 189,473
Boiler tube stop plug, M. Coryell 189,429
Boot and shoe, J. M. Bibbins 189,333
Boot and shoe, J. Fleming 189,444
Boot and shoe heel, M. A. Myers 189,487
Boot and shoe last, Batley, Keats & Neil 189,418
Boot jack, J. Buzzell 189,336
Boot safety sole, Watson & Crane 189,408
Breech loading ordnance, F. M. Swallow 189,329
Bridle attachment, S. S. Cummings 189,341
Broiler, C. D. Symonds 189,519
Butter and fruit jar, C. A. Sands 189,390
Button fastening, G. W. Beeley 189,419
Car brake, L. T. Hay 189,457
Car coupling, A. T. Bigalow 189,334
Car coupling, J. B. Zink 189,540
Car starter, R. Hermance 189,458
Carbureter, J. J. Paquette 189,490
Carriage top and seat rail, J. W. Post 189,385
Casting pipes, core for, J. Pennycook 189,492
Chandelier, F S. Shirley 189,509
Chuck for pipe fittings, J. Flower 189,445
Churn dasher, F. M. Johnson 189,469
Churn dasher, J. L. Maxwell 189,372
Clasp for skirt supporters, E. C. Fales 189,442
Coffin handle, F. X. Gartland 189,449
Coin, box for holding, C. E. McConnell 189,482
Coloring matters from aniline, Wolff & Betley 189,538
Cooking utensil, S. Spoor (r) 7,602
Corn harvester, W. H. & J. L. Cox 189,430
Corn planter, J. Leitch 189,315
Corset, M. Cohn (r) 7,596
Corset, I. D. V. Warner 189,405
Cotton chopper, J. B. Eaves 189,347
Cotton picker, O. R. Smith 189,396
Crayon for marking glass, etc., B. J. Clarke 189,338
Crockery, ornamenting, E. J. Gerard 189,450
Cultivator, J. C. Stevens 189,513
Cylinders, etc., polishing, M. H. McNair 189,483
Dental engine, G. W. Tripp 189,526
Dental engine, B. M. Wilkerson 189,409
Dish warmer, J. H. Wright 189,412
Ditching machine, S. P. Evans 189,440
Ditching machine, T. T. Fleener 189,350
Ditching machine, Slaton & Wadlington 189,395
Door bell, W. E. Sparks 189,397
Door bolt, R. Eichmuller 189,438
Drawbridge, R. C. Moundson 189,320
Eave trough cover, J. R. Creighton 189,431
Electroplating wire, Wallace & Smith 189,533
Engraved plates, etc., polishing, R. Neale 189,377
Exercising machine, Hansom & Russell 189,356
Exercising machine, G. W. Wood 189,539
Eyeglass, J. S. Spencer 189,511
Fan attachment, Thompson & Bergstrom 189,523
Fats, rendering, W. E. Andrew 189,541
Feed cutter, J. R. Whittemore (r) 7,605
Fence, iron, Root & Strickland 189,323
Fence, iron, J. H. Van Dorn 189,543
Fence post, W. B. Markham 189,480
Filter, liquid, M. Lansburgh 189,364
Fire arms, lock for, I. Robbins 189,387
Fire arms, wiper for, J. T. Hamilton 1889,455
Fire kindler, C. H. Hayden 189,310
Flour cupboard and knead board, F. M. Mahan 189,479
Fly fan, J. F. McMillen 189,373
Fly fan, G. W. J. Woltz 189,537
Fly wheels, etc., balancing, C. Seymour 189,506
Fruit drier, J. M. Keeler 189,472
Fruit jar, J. L. Mason 189,316
Fuel, artificial, J. Q. A. Ziegler 189,413
Furnace, heating gas, P. W. Mackenzie 189,367
Gaiter, C. Libby 189,476
Gas meter, register, etc., J. J. Squire (r) 7,601
Gate, automatic, T. E. Breakey 189,300
Glassware manufacture of, W. Fox 189,351
Grain drill, C. E. Patric 189,383
Grinding hollow ware, etc., W. Scully 189,505
Grinding machine, S. Bevan (r) 7,595
Grinding mill, J. Mellinger 189,484
Hammer, riveting, E. Wright 189,411
Handles, attaching, F. G. & W. F. Neidringhaus 189,378
Harness breast collar, W. Gibbs 189,308
Harness pad, M. V. Longsworth 189,365
Hides and skins, treating, N. Wilson 189,536
Hitching, post, W. N. Hutchinson 189,464
Hop drier, C. A. Sands 189,389
Hop press, J. Jakel 189,465
Horse hay rake, L. Myers (r) 7,599
Horse power, traction, D. T. Gillis 189,354
Horse protector, W. S. Marsh 189,369
Horseshoe machine, W. Roberts 189,322
Hose nozzle, J. H. Stump 189,328
Hot water apparatus, E. Lawler 189,314
Hub cap and axle nut, A. R. Cushman 189,433
Hub, elastic, G. W. Hayes 189,357
Hub, elastic, Sammis & Hayes 189,388
Hub, metallic, C. E. Owen 189,489
Hub runner, G. F. Kimball 189,362
Hydraulic elevator, E Brewer 189,424
Hydraulic engine, C. D. Page 189,380
Hydrocarbon burner, J. Bishop 189,421
Ice ax, W. H. Coleman 189,339
Ice machine, S. Tragheim 189,525
Key and knob fastener, W. Neracher (r) 7,600
Key for locks, J. Schade 189,503
Key for locks, W. H. Taylor 189,521
Keys, stock for the manufacture of, W. H. Taylor 189,520
Knitting needles, L. E. Salisbury 189,500, 189,501, 189,502
Lamp burner, Hallas & Weeden 189,542
Lamp chimney, H. L. Ives 189,359
Lamp extinguisher, E. C. Blakeslee 189,335
Lamp, fountain, E. J. Stearns 189,398
Lamp, street and park, J. Stimpson 189,514
Lamps, lighting night, J. R. Rowlands 189,499
Leather cutting die, A. Warren 189,406
Life boat, sectional, G. Bates 189,297
Lifting jack, A. R. Hurst 189,463
Lifting jack, V. Johnson 189,468
Lightning rod coupling, L. Bradley 189,298
Lightning rods for oil tanks, J. A. Sherriff 189,326
Liquid measure, S. R. Dummer 189,345
Lock for sliding doors, etc., J. W. Schoonmaker 189,392
Lock, strap, B. Kane 189,361
Loom, circular, J. E. Gillespie 189,353
Loom, gimp, R. Stone 189,515
Lumber dryer, J. J. Curran 189,432
Magazine cane gun, M. Daigle 189,305
Milk cooler, B. D. Miller 189,485
Moistening pad, C. E. Stockder 189,517
Monument, A. Smith 189,327
Music, electro-pneumatic, W. F. Schmoele *et al* 189,391
Nail plates, pile for, W. H. Powell 189,495
Nozzle and sprinkler, N. Malmquist 189,368
Nutmeg grater, J. Meyer 189,375
Oven, portable, E. V. Van De Mark 189,403
Packing demijohns, etc., G. W. Peck 189,491
Pantaloons, shaping, E. B. Viets, (r) 7,603
Paper bag, A. S. Dennison 189,342
Paper box, A. Goldback 189,454
Pavement, stone, B. F. Camp 189,337
Pen, fountain, A. T. Cross 189,304
Petroleum products, etc., H. W. C. Tweedle. 189,401, 189,402
Photographic burnisher, J. H. Ferguson 189,348
Pianos, hollow support for, J. Fairman 189,441
Pipe coupling, S. Lightburne, Jr 189,477
Plow, D. P. Ferguson 189,443
Plow, J. C. Jenkins 189,466
Plow, J. Reich 189,496
Printing press, J. Wade 189,532
Pump, W. S. Davis 189,306
Pump bucket, chain, W. Cooper 189,428
Pump, steam, C. Ahrens 189,414
Pump, suction and force, T. B. Swan 189,518
Pump pipe joint, etc., J. B. Eads 189,436
Railway gate, Fox & Vorwald 189,447
Railway joint, Palm & Fitzgerald 189,381
Railway rails, bending, W. R. Jones 189,471
Reverberatory furnace, J. Morrison 189,486
Revolving firearm, O. Jones 189,360
Boad scraper, P. Schneider, Sr 189,324
Safety pin shield, W. A. Butler 189,425
Sap spout, E. Willis 189,330
Sash balance, B. S. McCune 189,317
Saw grinder, E. P. Terrell 189,522
Saw guipe, adjustable, G. W. Baker 189,416
Saw mills, log turner for, J. Orm 189,379
Saw, scroll, J. A. House 189,461
Saw sharpener, J. Walsh 189,534
Sawing machine, M. Rose 189,498
Sawing machine, scroll, G. H. Truxell 189,527
Scales, platform, H. T. Lawton 189,475
Scrubbing machine, P. Byrne, Jr 189,426
Seed planter, J. Wafer 189,404
Seeder and cultivator, W. A. Van Brunt (r) 7,604
Seeder and fertilizer, O. Stone 189,516
Sewing machine shuttle, W. Bown 189,423
Sewing extension table, H. G. Crawford 189,340
Sewing machine take-up, J. L. Follett 189,446
Shavings. grinding, I. & A. G. Tompkins 189,399
Shell, B. B. Hotchkiss 189,358
Shot cartridge, H. H. Barnard 189,417
Show case, W. T. Sherer 189,508
Skate, roller, R. Gibson 189,451
Spelling, teaching, D. A. Willbanks 189,535
Steam pipe covering, P. Carey 189,301
Steam radiator, R. S. Gillespie 189,452
Steam tank for cooking in cans, F. M. Warren 189,407
Steaming fabrics, etc., W. Mather 189,371
Still, T. Gaff 189,448
Stirrup, H. H. Knight 189,363
Stop cock lock, H. C. Meyer & Co. (r) 7,598
Stove caster frame, E H Voorhees 189,531
Stove drum, Vosburgh & Van Slyck 189,530
Stoves, zinc board for, E. Jones 189,470
Sugar, clarifying, J. Schwartz 189,504
Suspenders, J. R. Pollock 189,494
Suspenders, A. Shenfield 189,394
Target, W. H. H. Norcross 189,321
Target, spherical glass, A. H. Bogardus 189,422
Tea kettle, J. Reinig 189,497
Telescopic ballast tube, A. Berghold 189,420
Thrashing machine, concave, J. H. Sharp 189,507
Three horse equalizer, E. B. Decker 189,435
Tobacco pail cover, F. A. Braymer, Jr 189,299
Tobacco stem flattener, N. H. Borgfeldt 189,296
Toe calks, making, H. C. Field 189,349
Trunk, etc., H. F. Worthington 189,410
Turbine, Osborn & Lybarger 189,488
Tuyere machine, J. E. Atwood 189,295
Umbrella runner, T. G. Hojer 189,460
Valve, balanced, W. Stephens 189,512
Valve, circular, H. L. Tumy 189,400
Valve, steam pump, J. W. Mathieson 189,370
Valve, safety, I. M. Phelps 189,493
Vehicle hub and box, G. W. Eldridge 189,439
Vehicle hubs, cap for, E. G. Edgley 189,437
Vehicle spring, J. W. Groat 189,355
Vehicle wheel, J. McGowan 189,318
Ventilator, Harrold & Satterlee 189,456
Ventilator, P. Mihan 189,376
Vessels, construction of, N. G. Herreshoff 189,459
Wagon bed, R. R. Hunt 189,462
Wagon box strap bolt, J. Jensen 189,467
Wagon tongue support, R. Dudley 189,344
Washer and amalgamator, B. Tyson 189,528
Washing machine, S. L. Denney 189,343
Washing machine, E. McBride 189,481
Washing machine, D. Miller 189,319
Watch roller abstractor, B. Frese 189,307
Weed hider, McDonel, Thorn & Ewing 189,374
Wheel tire, I. N. Pyle 189,386
Whiffletree attachment, J. D. Lane 189,474
Windmill, G. R. Comstock 189,302
Window sash, J. Petri 189,384
Wire fabric, H. R. Van Eps 189,529
Wooden rods, etc., making, Smith & Saltar 189,510
Wrench, J. B. Fox 189,352
Wrench, J. D. Lovell, administrator of A. G. Coes. 189,366

DESIGNS PATENTED.

9.892.—CASSIMERES.—F. S. Bosworth, Providence R. I.
9,893.—CARPETS.—J. H. Bromley, Philadelphia, Pa.
9,894.—CARPETS.—H. F. Goetz, Boston, Mass.
9,895.—CASSIMERES.—T. Holmes, Brooklyn, N Y.
9,896.—SASH HOLDER.—T. Overton, Rockport, Texas.
9,897.—SIGNS.—A. D. Smith, Cincinnati, Ohio.
9,898.—CASSIMERES.—W. A. Walton, Providence, R. I.
9,899.—TOWEL BORDERS, ETC.—R. T. Webb, Randallstown, Ireland.

Advertisements.

Inside Page, each insertion - - - 75 cents a line.
Back Page, each insertion - - - $1.00 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 Friday morning to appear in next issue.

Good and Useful Practical Books.

Armengaud, Amoroux, and Johnson.—The Practical Draughtsman's Book of Industrial Design, and Machinist's and Engineer's Drawing Companion. Illustrated by fifty folio steel plates and fifty wood-cuts. New edition. 4to. $10 00
Armstrong.—The Construction and Management of Steam Boilers. By R. Armstrong, C.E. 5th edition, illustrated 75
Baker.—A Treatise on the Steam Engine, with Rules and Examples for the use of Practical Men. 12mo. 75
Beans.—Treatise on Railroad Curves and the Location of Railroads. By E. W. Beans . . . $1 50
Beckett.—Treatise on Clocks, Watches, and Bells. By Sir Edmund Beckett. Bart. Illust. 12mo. . $1 75
Bell.—Carpentry made Easy. 200 illus. 8vo. . $5 00
Blenkarn.—Practical Specifications of Works executed in Architecture, Civil and Mechanical Engineering, and in Road Making and Sewering. By John Blenkarn. 15 folding plates. 8vo. . . . $9 00
Booth.—Marble Worker's Manual. By M. L. Booth. 12mo. $1 50
Bourne.—Recent Improvements in the Steam Engine. By John Bourne, C.E. With numerous illustrations. 16mo. $1 50
Brown.—Five hundred and Seven Mechanical Movements. By Henry T. Brown. 12mo. . . $1 00
Buckmaster.—Elements of Mechanical Physics. By J. C. Buckmaster. Illust. 12mo. . . . $1 50
Burgh.—Practical Rules for the Proportions of Modern Engines and Boilers for Land and Marine Purposes. By N. P. Burgh. 12mo. $1 50

☞ The above or any of our Books, sent by mail, free of postage, at the publication price.

Our new and enlarged CATALOGUE OF PRACTICAL AND SCIENTIFIC BOOKS—96 pages, 8vo.—and other Lists, sent free to any one who will furnish his address.

HENRY CAREY BAIRD & CO.,
INDUSTRIAL PUBLISHERS AND BOOKSELLERS,
810 Walnut Street, Philadelphia.

AIR COMPRESSORS

FOR ALL PURPOSES.
A SPECIALTY of HEAVY PRESSURES.
THE NORWALK IRON WORKS CO.,
SOUTH NORWALK, CONN.

The best Washing Machine in the world.

Patented in 1875.

The inventor of this Machine is offering to manufacturers the right of building it, in consideration of a royalty. This is the only machine that will wash clothes as thoroughly as if done by hand, and not injure the clothes. Its construction is simple and durable, and it can be sold for a price that will not be above the means of any family. A working machine is kept for examination at No. 437 Grove Street, Jersey City, N. J., where further particulars will be given.
MATHIAS COMMERCE, Inventor.

MANUFACTURERS WANTING ROOM, with power, will find it to their interest to communicate with us. This is one of the best manufacturing points in the United States. We have rooms in our present buildings to accommodate a few more manufacturers, and will erect additional factories to accomodate applicants. Advise us what room and power is wanted, also your business. BODLEY BROTHERS,
"Wheeling, W. Va.

OPIUM and Morphine habit cured painless; No Publicity. Dr CARLTON 187 Washington St., Chicago, Ill.

$95 A month and expenses. SALESMEN WANTED to sell to DEALERS. SAMPLES FREE. **CANDY & NOVELTIES** LETTERS must have enclosed return postage. H. SMITH & Co., Confectioners, Cincinnati, O.

New Styles. Low Prices. **BOLT CUTTERS.** H. B. Brown & Co. New Haven, Conn.

$8 for complete set of Engine Castings. 2-in. bore, 4-in stroke. For cut and particulars, address WM. DUSTON, 123 Exchange Place, Phila., Pa.

PLUMBAGO. PLUMBAGO.

Users of Plumbago, for lubricating and other purposes, can be supplied with the finest quality by
THE EAGLE PLUMBAGO COMPANY,
Uwchland, Chester Co., Pa.
Samples and circulars sent on application.

GOOD Collar Button, and our catalogue, free to all who send 3 cent stamp. W. K. LANPHEAR & CO.

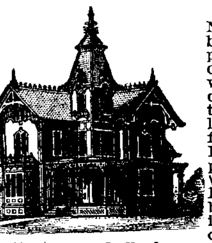
AGENTS WANTED FOR THE BEST and cheapest Patent Beer Preserver. Liberal discount to Agents. References required. None but responsible and energetic parties need apply. For circulars and particulars, address THE KAYSER GAS GENERATOR Co., No. 14 Pearl St., Buffalo, N. Y.

30 VISITING CARDS, WITH NAME, 10c., POST-PAID. Agent's outfit 10c. A. J. STINE & CO., Dallastown, Pa.

JUST ISSUED—"THE ANALYSIS OF RELIGIOUS BELIEF," by Viscount Amberley, son of Lord John Russell, late Premier of England. A work of profound research, and just the thing for inquiring, thinking people. The lengthy and able article on "Jesus Christ" is alone worth four times the price of the work. Republished complete in one volume from the London edition (2 vols., 8vo.), and at one-fifth the price. Cloth, $3; leather, $4; morocco, gilt edge, $4.50. Sent by mail at these prices. D. M. BENNETT, Publisher, 141 Eighth Street, New York.

EMPLOYMENT.

I want **1,000** agents to canvass for the COMPLETE HERBALIST. I will give such terms and furnish such advertising facilities that no man need make less than $200 per month and all expenses—no matter whether he ever canvassed before or not. Address DR. O. PHELPS BROWN, 21 Grand Street, Jersey City, N. J., and full particulars will be sent by return mail.



"HOME BUILDING." Now ready.—A splendid book, 400 quarto pages; 42 plates, 45 original designs of buildings of all classes, with specifications and costs. Material and labor tables, with prices at nearly 500 cities and towns from New York to San Francisco. Besides, 250 pages describing places, with statistics and hints INVALUABLE to ALL building, improving, seeking a home or health, mechanics, real estate men, investigators, and all who care to keep posted and save money. PRICE, $5 post-paid. Send money order to E. C. HUSSEY, Publisher, 191 Broadway, New York. Send 2 cent stamp for Specimen Catalogue.

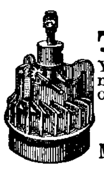
$95 A Month and Expenses. SALESMEN WANTED to **CIGARS** Sell to DEALERS. SAMPLES FREE. LETTERS MUST have enclosed a 3-cent STAMP for return POSTAGE. YARA CIGAR CO., Cincinnati, Ohio.

COPY YOUR LETTERS.

Business Men, Clergymen, Correspondents, Traveling Agents, and all, should copy their letters by a new mode. A copy of writing is taken easily, neatly, and instantly without press. Full outfit sent by mail to any address on receipt of 25 cts. Agents wanted. Address
CHAPMAN & HITZ, Madison, Ind.

PATENTS at AUCTION.

Inventors and others desiring to dispose of their Patent Rights will be offered an unusual opportunity to realize an immediate cash return at the great Auction Sale, to take place at 53 Liberty St., New York, during the month of May. Those who desire to be represented will address at once G. W. KEELER, Auct'r, Salesroom, 53 Liberty St., N. Y.

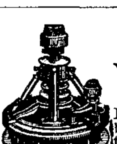


RISDON'S IMPROVED
TURBINE WATER WHEEL
Yielded at the test of Turbines at Centennial Exposition the best results at all stages of gate. Send for circular to
T. H. RISDON & CO.,
Mt. Holly, N. J.
Manufacturers of MILL MACHINERY.

WESSELL METAL, A PERFECT IMITATION of gold in color, surface, and acid tests, for manufacturers of imitation jewelry, and other workers in fine yellow metal. Wessel Manuf'g Co., No. 317 E. 22d St., N. Y.

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
N. B.—The suit against Imhaeuser & Co., of New York, was decided in my favor, June 10, 1874. Proceedings have been commenced against Imhaeuser & Co. for selling, contrary to the order of the Court. Persons using clocks infringing on my patent, will be dealt with according to law.

SPECIAL MACHINERY, TOOLS, MODELS, AND Patented Articles made to order by A. A. POOL & CO., 55 R. R. Ave., Market St. Station, Newark, N. J.



N. F. BURNHAM'S
1874
WATER WHEEL
Is declared the "standard turbine," by over 600 persons who bought and use them with part and full gate open. Pamphlets Free.
N. F. BURNHAM, York, Pa.

OTIS' SAFETY HOISTING Machinery.
OTIS BROS. & CO., No. 348 Broadway, New York.

50 Visiting Cards, with name, 10c. and stamp. Ag'ts Outfit 10c. L. C. COE & CO., Bristol, Ct.

Revolvers 7-shot $2.50, 70 kinds. Guns & Rifles $5 to $500. Monster Ill. Cat. for 3-ct. stamp. WESTERN GUN WORKS, Chicago, Ill.

VANDERBURGH, WELLS & CO., MACHINISTS' Pattern and Brand Letters, etc., Complete Newspaper Outfits, Engravers' Boxwood, etc.
18 Dutch Street, cor. Fulton, New York.

$66 a Week in your own town. Terms and $5 outfit free. H. HALLETT & CO., Portland Maine.

AMERICAN JEWELRY COMPANY'S
AMETHYST CASKET SENT FREE

to any address, with our **New Illustrated Catalogue** (in book form), containing over 500 full size engravings of the latest styles of **Jewelry** and **Watches** (of our own manufacture), with valuable information
HOW TO BECOME AGENTS.

Our Amethyst Casket contains one elegantly engraved Lady's Brooch, Amethyst setting; one pair elegantly engraved Lady's Ear Drops, amethyst settings; one elegant Amethyst Ring inlaid with Pearls; one elegant pair of Amethyst Sleeve Buttons; one elegant Amethyst Gent's Pin; Three (3) elegant Amethyst Studs; one elegant engraved Collar Button; one elegant Band Ring, engraved "Friendship;" one elegant heavy Wedding Ring; all of which are the finest gold-plate, and the exact size of the engravings in this announcement, and arranged in a beautiful white pink-lined casket.
On receipt of Seventy-Five (75) Cents, to pay cost of postage and packing, the above **Amethyst Casket and Catalogue** will be SENT FREE by mail, postpaid. This announcement is made to introduce the elegant styles of Jewelry manufactured by us. Address

AMERICAN JEWELRY COMPANY.—CINCINNATI, OHIO.

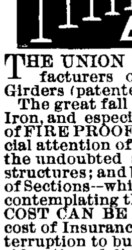
"We have examined the goods in the Amethyst Casket of the American Jewelry Company, and find them to be in every way as represented."—SOUTHERN AGRICULTURIST, Louisville, Ky.

A NEW DEPARTURE. TRAVELING and local salesmen wanted. STAPLE GOODS. NO PEDDLING Salary $75 a month. Hotel and traveling expenses paid. S. A. GRANT & CO., manufacturers of ENVELOPES and PAPER, 2, 4, 6, and 8 Home St., CINCINNATI, OHIO.

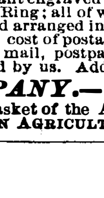
WROUGHT IRON BEAMS & GIRDERS

THE UNION IRON MILLS, Pittsburgh, Pa., Manufacturers of improved wrought iron Beams and Girders (patented).
The great fall which has taken place in the prices of Iron, and especially in Beams used in the construction of FIRE PROOF BUILDINGS, induces us to call the special attention of Engineers, Architects, and Builders to the undoubted advantages of now erecting Fire Proof structures; and by reference to pages 52 & 54 of our Book of Sections—which will be sent on application to those contemplating the erection of fire proof buildings—THE COST CAN BE ACCURATELY CALCULATED, the cost of Insurance avoided, and the serious losses and interruption to business caused by fire; these and like considerations fully justify any additional first cost. It is believed, that were owners fully aware of the small difference which now exists between the use of Wood and Iron, that in many cases the latter would be adopted. We shall be pleased to furnish estimates for all the Beams complete, for any specific structure, so that the difference in cost may at once be ascertained. Address
CARNEGIE, BROS. & CO., Pittsburgh, Pa.

EUREKA SAFETY POWER!



Practically **impossible to explode.** Tested to 300 lbs. pressure per square inch. 2-Horse Power, **$150,** 3 to 4 H. P., **$250.** Also, Stationary Engines and Boilers, and **Spark Arresting Portable Engines** for plantation use. Send for our circular. Discount to the trade.
B. W. PAYNE & SONS,
Corning, N. Y.



BARNES' FOOT POWER MACHINERY.
13 Different machines with which Builders, Cabinet Makers, Wagon Makers, and Jobbers in miscellaneous work can compete as to QUALITY AND PRICE with steam power manufacturing; also Amateurs' supplies, saw blades, fancy woods and designs. Say where you read this, and send for catalogue and prices.
W. F & JOHN BARNES,
Rockford, Winnebago Co., Ill.

Pond's Tools

Engine Lathes, Planers, Drills, &c.
Send for Catalogue. DAVID W. POND, Successor to LUCIUS W. POND. **Worcester, Mass.**

WE ENAMEL
in FINE JET BLACK every variety of turned wood work parts of machinery, castings, tin-ware and other metal work ENAMELED JET GOODS, in wood or metal, made to order AMERICAN ENAMEL CO. 17 WARREN ST PROVIDENCE, R. I.

MACHINERY

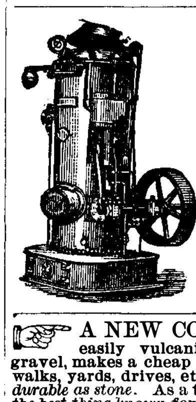
OF EVERY DESCRIPTION.
The George Place Machinery Agency
121 Chambers & 103 Reade Streets, New York.

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.

ROOTS' FORCE BLAST BLOWER.
FIRST PREMIUM AWARDED
AT PARIS & VIENNA.
THOUSANDS IN USE BOTH
IN THIS COUNTRY & EUROPE.
SPEED ONLY 100 TO 250 REV. PER MIN.
SAVES HALF THE POWER USED BY FAN.
P.H. & F.M. ROOTS MFRS. CONNERSVILLE IND.
S. S. TOWNSEND, 6 CORTLANDT ST., N. Y., GENL. AGT.

FIRE AND RED BRICK PRESSES. FACTORY, No. 309 S. Fifth St., Phila. S. P. MILLER & SON.



THE
TRADE ENGINE.

Noiseless in operation—Perfect in workmanship—all light parts of Cast Steel.
Every Engine indicated, and valve corrected to give the highest attainable results.
Warranted superior to any semi-portable Engine in the market!
Send for Price List and Circular.
HERRMANN & HERCHELRODE M'F'G Co.,
Dayton, Ohio.

☞ A NEW COMPOUND THAT WILL easily vulcanize, and intermixed with fine gravel, makes a cheap and elegant pavement for side-walks, yards, drives, etc. Not affected by weather, and *durable as stone.* As a thin covering, it is thought to be *the best thing known* for roofs, etc. Address
H. K. SHANCK, Patentee, Dayton, Ohio.

YOU ask WHY we can sell First-Class 7 1-3 Octave Rosewood Pianos for $290. Our answer is, that it costs less than $300 to make any $600 Piano sold through Agents, all of whom make 100 per ct. profit. We have no Agents, but sell DIRECT to Families at Factory price, and warrant five years. We send our Pianos everywhere for trial and require no payment unless they are found satisfactory. Send for our Illustrated Circular, which gives full particulars, and contains the names of over 1500 Bankers, Merchants and Families that are using our Pianos in every State of the Union. Please state where you saw this notice. Address,
U. S. PIANO CO., 810 Broadway, N. Y.

AYER & SON'S MANUAL For Advertisers
A complete guide to advertisers. *New Haven Journal.*—A necessity to all who advertise. *Louisville Commercial.*—The most complete and reliable work of the kind. *Pittsburg Gazette.*—**Sent free** to all who advertise.
N. W. AYER & SON Advertising AGENTS, TIMES BUILDING, PHILADELPHIA.
Get our Estimate before making any advertising contracts. Our business is large. Facilities unsurpassed. Prices the lowest. Terms the best.

$12 a day at home. Agents wanted. Outfit and terms free. TRUE & CO., Augusta, Maine.

Lathes, Planers, Shapers, Drills,

Gear & Bolt Cutters, &c. E. GOULD, Newark, N. J.

WATCH GUARD CHARMS.

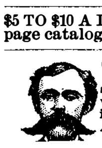
One inch Standard Steel Rule, with Split Ring, 30 cts.; nickeled, 40 cts.; silvered, 50 cts.; gilded, 75c. Mailed on receipt of price. Darling, Brown & Sharpe, Providence, R. I.

SEE PHOTOGRAPHIC APPARATUS & CHEMICALS complete, with directions, **$10.** No toy; takes pictures 4x5 inches. Send for circular.
B. MORGAN, 428 Monmouth St., Jersey City, N. J.

$55 TO $77 a week to Agents. $10 *Outfit Free.* P. O. VICKERY, Augusta, Maine.

$984 Made by one Agent in 57 days. 13 new articles. Samples free. Address, **C. M. LININGTON, Chicago.**

$5 TO $10 A DAY TO AGENTS. SAMPLES FREE. 32 page catalogue. L. FLETCHER, 11 Dey St., N. Y.

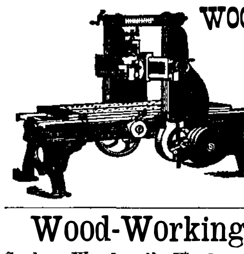


$100.00 REWARD. This MOUSTACHE or HEAVY BEARD produced on a smooth face by the use of **DYKES BEARD ELIXIR,** without injury, or will forfeit $100.00. Price by mail in sealed package 25 cents, 3 packages only 50 cents. A. L. SMITH & Co., Palatine, Ill., Sole Agents.
☞ We caution the public against imitations.

Brown & Sharpe M'f'g Co.,

PROVIDENCE, R. I.,

Have ready for delivery Universal and Plain Milling Machines, two sizes of each; Revolving Head Screw Machines of three sizes; Screw Finishing and Slotting Machines; Grinding Machines of three kinds; Grindstone Truing Devices and Patent Cutters for the Teeth of Gear Wheels, which can be sharpened by grinding without changing their form. Index plates on hand, and made or drilled to order. *Our new Illustrated Catalogue mailed on application.*



WOOD & LIGHT Machine Co.
WORCESTER, MASS.
Manufacture all kinds of
Iron-Working Machinery,
including many novelties.
Shafting, Pulleys, &c.
Send for Circulars.

Wood-Working Machinery,

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

Patent Adjustable Rubber Bucket

for Chain Pumps, with the buckets ten feet apart on the chain. Will raise a full flow of water from deep wells. It is a lifting and suction pump, works easy, and very durable. State and county Rights for sale. THOMAS KENYON, P. O. Box 103, Hamilton, Ohio.

PHOTOGRAPHIC APPARATUS COMPLETE, with thorough printed instructions, chemicals, etc., $5 to $25. Send stamp for circulars.
E. SACKMANN & CO.,
278 Pearl Street, near Fulton, New York.

WANTED MEN to travel and sell to **Dealers** our unbreakable glass chimneys and lamp goods. **NO PEDDLING.** Salary liberal. Hotel and traveling expenses paid. MONITOR LAMP CO., 264 Main St., CINCINNATI, OHIO.

TOOLS for stone cutters, contractors, and masons. I. V. MEAD, Manufacturer, 370 Ave. A, near 23d St., N. Y. Pat. Bush Hammers a specialty.

LEFFEL WATER WHEELS.

With recent improvements.
Prices Greatly Reduced.
7000 in successful operation.
FINE NEW PAMPHLET FOR 1877,
Sent free to those interested.
James Leffel & Co,
Springfield, O.
109 Liberty St., N. Y. City.

THE TRUANT BOYS: A more ingenious picture than the Toll-gate. Sent free for stamp. E. C. Abbey, Buffalo, N.Y.

Advertisements.

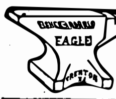
Inside Page, each insertion - - - 75 cents a line.
Back Page, each insertion - - - $1.00 a line.

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 Friday morning to appear in next issue.

GUARDIOLA'S
COFFEE & SUGAR MACHINERY

Coffee, Malt, Corn, Cocoa, and Grain-Drying Machine. Coffee-Hulling and Polishing Machines. Coffee-Washing Machine. Helix Sugar Evaporator.

Messrs. C. ADOLPHE LOW & CO., 42 Cedar Street, Messrs. MUNOZ & ESPRIELLA, 52 Pine Street, New York, are Mr. Guardiola's Agents, and they will give prompt attention to all orders for any of the above machines.



Best Tempered Cast Steel.
Retail Price, 9 Cents per lb.
WARRANTED. ☞ Send for Circular.
Fisher & Norris, Trenton, N. J.

MACHINISTS' TOOLS.

NEW AND IMPROVED PATTERNS.
Send for new illustrated catalogue.

Lathes, Planers, Drills, &c.
NEW HAVEN MANUFACTURING CO., New Haven, Conn.

PETTENGILL'S
NEWSPAPER DIRECTORY
AND
ADVERTISERS' HAND-BOOK
FOR 1877.

PRICE, - - ONE DOLLAR.

Containing complete lists of American Newspapers and other periodicals, with such details of information as are most useful to advertisers and business men.

The book contains 376 pages, and is the most complete and convenient work of the kind ever published. It will be sent to any address, postpaid, upon receipt of the very low price of *one dollar* per copy.

S. M. PETTENGILL & CO.,
PUBLISHERS,
37 Park Row, New York.

[ESTABLISHED 1846.]

Munn & Co.'s Patent Offices.

The Oldest Agency for soliciting Patents in the United States.

THIRTY YEARS' EXPERIENCE.

MORE PATENTS have been secured through this agency, at home and abroad, than through any other in the world.

They employ as their assistants a corps of the most experienced men as examiners, specification writers, and draughtsmen, that can be found, many of whom have been selected from the ranks of the Patent Office.

SIXTY THOUSAND inventors have availed themselves of Munn & Co.'s services in examining their inventions and procuring their patents.

MUNN & CO., in connection with the publication of the SCIENTIFIC AMERICAN, continue to examine inventions, confer with inventors, prepare drawings, specifications, and assignments, attend to filing applications in the Patent Office, paying the Government fees, and watch each case, step by step, while pending before the examiner. This is done through their branch office, corner F and 7th Sts., Washington. They also prepare and file caveats, procure design patents, trade marks, and reissues, attend to rejected cases (prepared by the inventor or other attorneys), procure copyrights, attend to interferences, give written opinions on matters of infringement, furnish copies of patents, and, in fact, attend to every branch of patent business, both in this and in foreign countries.

A special notice is made in the SCIENTIFIC AMERICAN of all inventions patented through this agency, with the name and residence of the patentee. Patents are often sold, in part or whole, to persons attracted to the invention by such notice.

Patents obtained in Canada, England, France, Belgium, Germany, Russia, Prussia, Spain, Portugal, the British Colonies, and all other countries where patents are granted, at prices greatly reduced from former rates. Send for pamphlet relating specially to foreign patents, which states the cost, time granted, and the requirements for each country.

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 handbook of reference for everybody. Price 25 cents, mailed free.

Address

MUNN & CO.,
Publishers SCIENTIFIC AMERICAN,
37 Park Row, N. Y.

BRANCH OFFICE—Corner of F and 7th Streets, Washington, D. C.

NOYE'S
MILL FURNISHING WORKS

are the largest in the United States. They 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.

FOR SALE—A 25-HORSE POWER HARRISON Boiler, nearly new, by JAMES BINNS, Iron Founder, 27 Walworth St., Brooklyn, N. Y.

ESTABLISHED 1844.
JOSEPH C. TODD,

(Formerly of Todd & Rafferty), ENGINEER and MACHINIST. Flax, Hemp, Jute, Rope, Oakum, and Bagging Machinery, Steam Engines, Boilers, etc. Also Agent for the celebrated and improved Rawson & Rittinger Hoisting Engine. I will furnish specifications and estimates for all kinds of machinery. Send for descriptive circular and price. Address
J. C. TODD,
10 Barclay St., New York, or Paterson, N. J.

JOS. G. ROGERS & CO., MADISON, IND., wish to place a consignment of their Tannate of Soda BOILER SCALE PREVENTIVE in all important towns in the United States, to be sold on commission. Applications solicited. Send for book on Boiler Incrustation.

NON-COMBUSTIBLE STEAM BOILER AND PIPE
COVERING
WITH "AIR SPACE" IMPROVEMENT.
Saves 10 to 20 per cent. CHALMERS SPENCE CO., Foot E. 9th St. N. Y.; 1202 N. 2d St., St. Louis, Mo.

HARTFORD
STEAM BOILER
Inspection & Insurance
COMPANY.

W. B. FRANKLIN, V. Pres't. J. M. ALLEN, Pres't.
J. B. PIERCE, Sec'y.

$5 to $20 per day at home. Samples worth $5 free. STINSON & Co., Portland, Me.

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

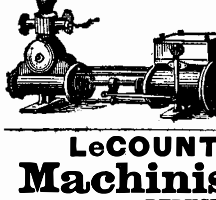
PERFECT
NEWSPAPER FILE

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.

MACHINERY OF IMPROVED STYLES FOR making SHINGLES, HEADING and STAVES; also GUAGE LATHES for TURNING HANDLES. Sole makers of Law's Pat. Shingle and Heading Sawing Machine. Address TREVOR & CO., Lockport, N. Y.

Local and Traveling Agents Wanted in every State and Territory in the Union, to sell Mechanical Goods. Liberal commission offered. Prompt replies desired, and full details. Address "MORGAN," Box 2874, N. Y.



GUILD & GARRISON,
34 to 44 First St.,
Williamsburgh, N. Y.,
Manufacturers of
STEAM PUMPS
for all purposes.
Also Vacuum Pumps, Vacuum Pans, and Air Compressors.

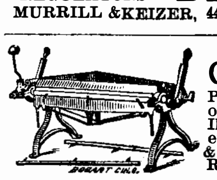
LeCOUNT'S PATENT
Machinists' Tools.

REDUCED PRICES.

Set Iron Dogs,	3-8 to 2 in.,	$5.60
" "	3-8 to 4 in.,	12.00
" Steel "	3-8 to 2 in.,	6.30
" " "	3-8 to 4 in,	13.00

Iron & Steel Clamps, Die Dogs, Clamp Dogs, Vice Clamps, Expanding Mandrels, &c. Send for latest Price List to C. W. LE COUNT, South Norwalk, Conn.

DAMPER REGULATORS **BEST** AND LEVERS GAUGE COCKS.
MURRILL & KEIZER, 44 HOLLIDAY ST., BALTIMORE.



The Double Excentric
Cornice Brake.

Patented 1873. In use throughout the U. S. and Canada. For Illustrated Circular, prices, etc., address J. M. ROBINSON & CO., successors to Thomas & Robinson, Cincinnati, O.

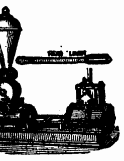
Incombustible Mineral Wool

The best and cheapest insulator of heat or cold. Send for circulars, 26½ Broadway, New York.
ALEXANDER D. ELBERS,
P. O. Box 4461. Agent for the Patentee.

$3 WATCHES. Cheapest in the known world. *Sample watch and outfit free to Agents.* For terms address COULTER & CO. Chicago

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.



Niagara
Steam Pump Works.
ESTABLISHED 1826.
CHARLES B. HARDICK,
No. 23 Adams Street, BROOKLYN, N. Y.

KNOWLES'
STEAM PUMP WORKS,
92 & 94 Liberty St., New York.

Great reduction in prices. Send for catalogue. The "Knowles" has always been the best steam pump made.

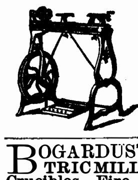
ROCK DRILLING MACHINES
AND
AIR COMPRESSORS
MANUFACTURED BY BURLEIGH ROCK DRILL CO.
SEND FOR PAMPHLET. FITCHBURG MASS.

Type and Printing Materials
FOR SALE.

The following Fonts of Type, in good condition, having been but little used:
Brevier, on Long Primer Body, about 550 lbs.
Brevier, 100 lbs.
Nonpareil, on Brevier Body, 360 lbs.
Agate, 250 lbs.
Sixteen Cases Job Type, in Cabinet.
All the above are Copper-faced.
Leads, Brass Rules, etc.
Cases, 44 pairs.
Column Galleys, brass bottomed, 6.
Chases, wrought iron, 2 pairs, 36x24 inches.
Composing Frames, 4.
Racks, 2.
Imposing Stones, one 75x30 inches, one 72x30, both on stands with drawers.
Roller Press.

The above were used on the SCIENTIFIC AMERICAN, and are in clean and perfect condition. The room in which the above is deposited is wanted for other purposes on the first of May, and the lot will be sold very cheap. Apply at the office SCIENTIFIC AMERICAN, 37 Park Row, N. Y., for further particulars.

EAGLE FOOT LATHES,



Improvement in style. Reduction in prices April 20th. Small Engine Lathes, Slide Rests, Tools, etc. Also Scroll and Circular Saw Attachments, Hand Planers, etc. Send for Catalogue of outfits for Amateurs or Artisans.
WM. L. CHASE & CO.,
95 & 97 Liberty St., New York.

BOGARDUS' PATENT UNIVERSAL ECCENTRIC MILLS—For grinding Bones, Ores, Sand, Old Crucibles, Fire Clay, Guanos, Oil Cake, Feed, Corn, Corn and Cob, Tobacco, Snuff, Sugar, Salts, Roots, Spices, Coffee, Cocoanut, Flaxseed, Asbestos, Mica, etc., and whatever cannot be ground by other mills. Also for Paints, Printers' Inks, Paste Blacking, etc. JOHN W. THOMSON, successor to JAMES BOGARDUS, corner of White and Elm Sts., New York.

$3 PRINTING PRESS!

Prints cards, envelopes, etc., equal to *any* press. Larger sizes for large work. *Do your own printing and advertising and save money.* Excellent spare hour amusement for old or young. Or it can be made *money making* business anywhere. Send 3c. stamps for large catalogue to
KELSEY & CO., Manufacturers, Meriden, Conn.

PUNCHING PRESSES. Drop Hammers and Dies, for working Metals, &c. THE STILES & PARKER PRESS CO., Middletown, Conn.

1872, 1873, 1874, 1875, 1876,
SCIENCE RECORD.

A few copies of these splendid books, copiously illustrated, are offered at the following very low prices. Persons desiring a condensed history of the most interesting Facts and Discoveries in the Arts, Sciences, and Inventions, for the years from 1872 to 1876 will find them recorded in the five volumes of the SCIENCE RECORD, now offered at half the original price.

Every Department of Science is treated in these volumes, and the important discoveries of the several years are not only faithfully described, but many of the subjects are illustrated with finely executed engravings, prepared expressly for these Annuals.

Among the subjects, the following are the most noteworthy, exhibiting in a condensed form a general account of the Progress of the World:
CHEMISTRY AND METALLURGY,
MECHANICS AND ENGINEERING,
ELECTRICITY, LIGHT, HEAT, SOUND,
TECHNOLOGY, THE USEFUL ARTS,
BOTANY AND HORTICULTURE,
AGRICULTURE,
RURAL AND HOUSEHOLD ECONOMY,
MATERIA MEDICA, THERAPEUTICS, HYGIENE,
NATURAL HISTORY AND ZOOLOGY,
METEOROLOGY, TERRESTRIAL PHYSICS,
GEOGRAPHY,
GEOLOGY AND MINERALOGY,
ASTRONOMY,
BIOGRAPHY AND NECROLOGY.

Each yearly volume contains about 600 octavo pages, including a large number of handsome engravings. They are bound in substantial and handsome bindings, and will be mailed on receipt of $1.25 each, or $5 for the set of five volumes.

They were published and heretofore sold at $2.50 each, or $10 for the set.

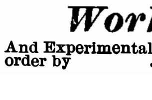
State, in remitting for a single volume, which year, from 1872 to 1876, is desired, remembering that the date of the volume covers the events and discoveries of the previous year. Send by mail on receipt of price. Address
MUNN & CO., PUBLISHERS.
37 Park Row, New York city.

PATENT
COLD ROLLED SHAFTING.

The fact that this shafting has 75 per cent. greater strength, a finer finish, and is truer to gauge, than any other in use, renders it undoubtedly the most economical. We are also the sole manufacturers of the CELEBRATED COLLINS' PAT. COUPLING, and furnish Pulleys, Hangers, etc., of the most approved styles. Price list mailed on application to JONES & LAUGHLINS, Try Street, 2d and 3rd Avenues, Pittsburgh, Pa. 190 S. Canal Street, Chicago, Ill., and Milwaukie, Wis. ☞ Stocks of this shafting in store and for sale by FULLER, DANA & FITZ, Boston, Mass. GEO. PLACE & CO. 121 Chambers St., N. Y.

$5 Outfit free. Salary guaranteed. Write at once to EMPIRE NOVELTY CO., 309 Broadway, New York.

DUC'S IMPROVED
PATENT ELEVATOR BUCKET,
FOR BREWERS, FLOUR MILLS, GRAIN ELEVATORS, SUGAR REFINERS, &C.



These buckets are made of the best charcoal stamping iron, and are warranted to outwear six of the "OLDSTYLE BUCKETS." The cost is about the same. Address T. F. ROWLAND, Brooklyn, E. D., N. Y.

Working Models

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

THE TANITE CO.,
STROUDSBURG, PA.
EMERY WHEELS AND GRINDERS.
GEO. PLACE, 121 Chambers St., New York Agent.

BUY YOUR BOILER AND PIPE
COVERING
direct from the Manufacturers.
ASBESTOS FELTING CO.,
Front St., near Gouverneur, N. Y.

Pyrometers, For showing heat of Ovens, Hot Blast Pipes, Boiler Flues, Super-Heated Steam, Oil Stills, &c. HENRY W. BULKLEY, Sole Manufacturer, 149 Broadway, New York.

A. S. CAMERON'S
PATENT
"SPECIAL" Steam Pump

Is the Standard of Excellence at home and abroad.

REDUCED PRICE LIST.

Number.	PRICE.	Steam Cyl.	Pump Cyl.	Stroke.
0	$ 50	3½ in.	2 in.	4
1	75	4	2	6
2	100	5	2½	6
3	150	6	3	7
4	200	7	3½	7
5	275	7	3½	10
6	325	8	4	10
7	400	10	5	12
8	425	10	6	12
9	480	12	7	12
10	550	14	9	15
11	700	16	10½	15
12	850	18	12	18

Illustrated Catalogue sent free, on application to the Inventor and Sole Manufacturer in the United States,
A. S. CAMERON,
Works, Foot of East 23d St.
NEW YORK CITY.

The HOADLEY
PORTABLE STEAM ENGINE
WITH AUTOMATICAL CUT-OFF REGULATOR
AND BALANCED VALVE.
THE BEST & MOST ECONOMICAL ENGINE MADE
SEND FOR CIRCULAR.
The J. C. HOADLEY CO. LAWRENCE, MASS.
STATE WHERE YOU SAW THIS.

The New $20 Microscope

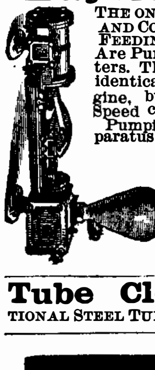
is fully equal to any that could have been bought three years ago for $50. Send for descriptive circular.

For the best book of practical instruction get "How to Use the Microscope," by John Phin. 75 cts. by mail.
INDUSTRIAL PUBLICATION CO., 176 Broadway, N. Y.

Pyrometers.

FOR Blast Furnaces, Bakers' Ovens, Boiler Flues, Superheated Steam, Oil Stills, Zinc and Lead Baths. Made under the patents of E. BROWN, 311 Walnut St., Philadelphia. Established 1860.

Dayton Cam Pump.



THE ONLY PUMP IN THE MARKET DESIGNED AND CONSTRUCTED ESPECIALLY FOR BOILER FEEDING.

Are Pumping water at 268° F. No Dead Centers. The Steam Valve is a plain Slide Valve, identical to the slide valve of a Steam Engine, but derives its motion from a cam. Speed can be regulated to suit evaporation. Pumping Returns from Steam Heating Apparatus a specialty.
☞ Send for Circular.

Smith, Vaile & Co.,
DAYTON, OHIO.

Tube Cleaners for cleaning Boiler Tubes. THE NATIONAL STEEL TUBE CLEANER Co. 814 E. 9th St., N. Y.

TO INVENTORS AND MANUFACTURERS

FOLLOWS & BATE, Manchester, England, Hardware and Machinery Merchants, are prepared to buy American Goods for Cash, and to act as Sole Wholesale Agents.

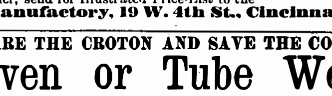
ALCOTT LATHES, for Broom, Rake and Hoe Handles. S. C. HILLS, 78 Chambers St. N. Y.

DROP FORGINGS and SPECIAL MACHINERY, THE HULL & BELDEN CO., Danbury, Conn.

F. ADEE & CO.'S PATENT
LEAD STENCH TRAPS.

Positive protection against Sewer-gas. Best and cheapest. See illustration, SCIENTIFIC AMERICAN, April 14th. Send for circular. F. ADEE, 275 Pearl St., N. Y.

JOHN HOLLAND'S
GOLD PENS

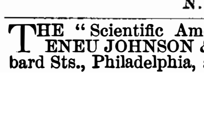


Received the Centennial Medal from the Judges on Awards, for "superior elasticity and general excellence." If not sold by your Stationer, send for Illustrated Price-List to the
Manufactory, 19 W. 4th St., Cincinnati.

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

CELEBRATED FOOT LATHES.



Foot Power Back-geared Screw Lathes, Small Hand and Power Planers for Metal, Small Gear Cutters, Slide-rests, Ball Machine for Lathes, Foot Scroll Saws, light and heavy Foot Circular Saws. Just the articles for Amateurs or Artisans. Highly recommended. Send for illustrated Catalogues.
N. H. BALDWIN, Laconia, N H

THE "Scientific American" is printed with CHAS. ENEU JOHNSON & CO.'S INK. Tenth and Lombard Sts., Philadelphia, and 59 Gold St., New York.