SCIENTIFIC AMERICAN

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BAND RE-SAWING MACHINE.

As a natural consequence of the practice of transporting lumber in planks or thick boards from the sawmill to the manufactory, and there converting it into forms and sizes suited to the wants of manufacturers, which was formerly done at the sawmill itself, a demand has been created for improved methods of such conversion, which should combine a maximum speed of execution with a minimum waste of material.

This work has hitherto been accomplished by circular saws or reciprocating saws. The former, however, owing to the necessary thickness of the blade, produced a waste of material not compensated for by the amount of work performed, while the latter method, although more economical in the waste of material, was found unprofitable on account of its slow operation.

In the matter of re-splitting lumber, the band sawing machine seems best adapted to meet all the requirements; as its great cutting speed, and the very thin gage of saws which can be used, combine at once the saving of time or labor with the saving of lumber.

The accompanying engravings (Figs. 1 and 2) illustrate a machine of this kind recently perfected by J. A. Fay & Co., Cincinnati, Ohio, which combines in its design and construction many improvements and features which careful study and experiment have convinced the inventors are necessary to its successful and economical operation.

The saw is carried upon two wheels five feet in diameter, placed at a short distance from each other, the upper wheel having a vertical adjustment, shown in Fig. 1, to allow for the decrease in the length of saws caused by breakage and rewelding. The wheels run in long bearings and have an outside bearing to secure additional firmness. The tension of the saw is produced by means of a weighted lever, shown in Fig. 2, in connection with the adjusting screw of the upper wheel, which compensates for any variation in the length of the saw by expansion or contraction caused by changes in temperature.

The patent roller guides, which support the back and sides of the saw above and below the lumber, are made of steel and gibbed to a supporting post. This post has a radial adjustment by which the guides will direct the saw to the center of the required cutting line. The guides can be quickly detached for the removal of the saw, and the upper guide has a vertical movement by means of hand wheel and gears to accommodate different widths of lumber.

The saw may be made to run upon any part of the periphery of the upper wheel by means of a device for tipping the wheel out of true perpendicular, or by a radial movement of the upright column, which throws the upper wheel out of a true parallel line with the lower one; and the saw being thus made to run on any desired part, there is no danger of it running off the wheel.

The feeding mechanism, consisting of four geared rollers of large diameter, is driven by friction, so arranged that, by different movements of the regulating lever in front of the machine, the operator can instantly stop or start the feed or graduate it from fast to slow. The guiding feed rolls are adjusted by hand wheel and screw, and the pressure feed rolls are governed by a weighted lever acting on a ratchet wheel by means of a pawl, and sufficient pressure may be obtained to straighten any warped boards. The feed rolls can be quickly adjusted to saw through the center or from the side of a plank, as may be desired.

The driving belt is tightened by an idler, attached to a lever swung to the lower wheel shaft, and moving concentrically with the driving pulley. The bearings are all provided with oiling devices, so that the wearing parts of the machine can be kept constantly lubricated. The machine is adapted for resawing lumber 30 inches wide and under, and down to the thinnest materials that admit of re-sawing. Its working capacity is stated at from 10,000 to 15,000 feet per day, depending upon the kind and width of lumber. The saw kerf is about $\frac{1}{16}$ thick; the thickness of the blade is number 19 gage. By this machine a large saving in lumber is effected: as, out of a $1\frac{1}{4}$ board, planed on both sides, three $\frac{3}{8}$ panels are obtained. The machine is so arranged as to be at all times under perfect control of the operator.

Several of these machines are in use, giving entire satisfaction. One of them may be seen in daily operation at J. A. Fay & Co's. space in the Centennial Exhibition, section B. 8, columns 61, 62 and 63, Machinery Hall, where they have on exhibition a large number of their labor-saving machines. For further particulars, address the manufacturers, as above.

A New Process for Making Illuminating Gas.

The *Revue Industrielle* describes a new illuminating gas apparatus devised by MM. Kidd & Barff, which is composed of an iron drum into which any kin d of carbon is introduced Carbonized peat gives excellent results; powdered anthracite, coke and wood charcoal may also be employed. In the interior of the cylinder is established a system of circular tubes which are filled with water led from an elevated reservoir. The coal is ignited, and the heat developes steam in the tubes at a pressure corresponding to the hight of the reservoir. A small tube conducts the steam below the fire and allows it to escape into the ash pit. The jet draws in air, and the mixture traverses the burning combustible from below upward. A series of interesting reactions then occur, the watery vapor, air, and carbon acting materially upon each other. The oxygen of the air and steam unites with the carbon to form a certain proportion of carbonic oxide, and a less quantity of carbonic acid. The hydrogen set at liberty and the nitrogen are found in the mixture when it escapes. The nitrogen alone is annoying. The quantity of carbonic acid may be greatly reduced by augmenting the hight of the layer of combustible. Carbonic oxide and hydrogen represent about 43 per cent of the mixture. A specimen of the gas obtained from carbonized peat gives on analysis: Carbonic oxide 28·5, hydrogen 14·5, nitrogen 53, carbonic acid 4. The gas contains no sulphur, either free or combined; and in order to use it for illuminating purposes it is only necessary to remove the carbonic acid, an operation of no great difficulty. It is calculated that 1 tun of coal by this process will yield about 98,868 cubic feet of illuminating gas, or, including the nitrogen, about double this volume. The operation is continuous, and there are no retorts to charge and empty. As the coal is consumed, a lever device throws in fresh supplies in closed boxes. The residue is a small quantity of ashes, and all the carbon appears to be mingled in the gas. The gas is remarkably pure, burns without the least odor, and produces only carbonic acid and water; hence it has no deleterious action on paint or gilding

New Applications of Salicylic Acid.

It has been determined that the addition of from 0·0005 to 0·001 part of salicylic acid to cistern water clarifies the same in a remarkable manner, and that water, which ordinarily, in the space of a month, would become foul and unfit to drink, remains perfectly pure and limpid. This property of the acid will doubtless be found of great value on board vessels making long voyages, as it has been determined that scurvy is often produced by the deterioration of water through too long sojourn in casks and tanks. The combination of salicylic acid with calcareous salts has also been noted by M. Berger to be so intimate that water, thus charged and treated, may be evaporated even to dryness without any lime deposit being formed. The acid is therefore one of the best (if not the best) preventives of steam boiler scale and incrustation; but until some cheaper way of producing it than now is practised is discovered, it can scarcely come into general use for this purpose.

Fig. 1.

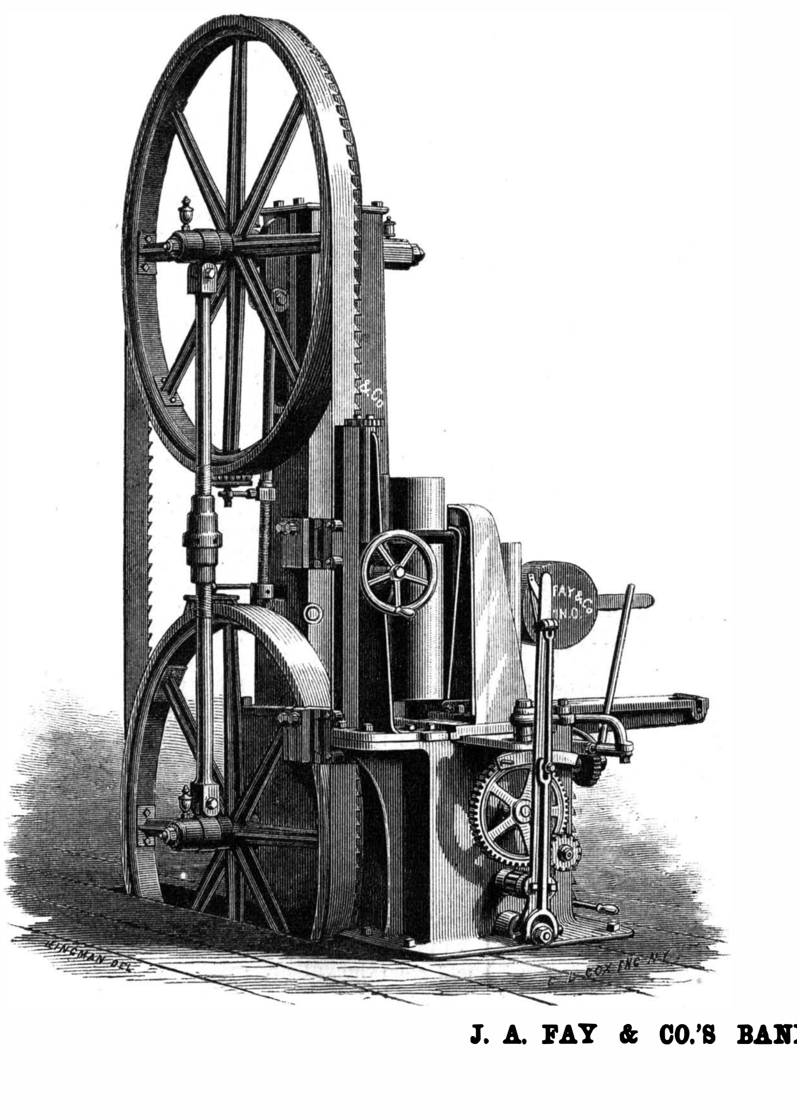
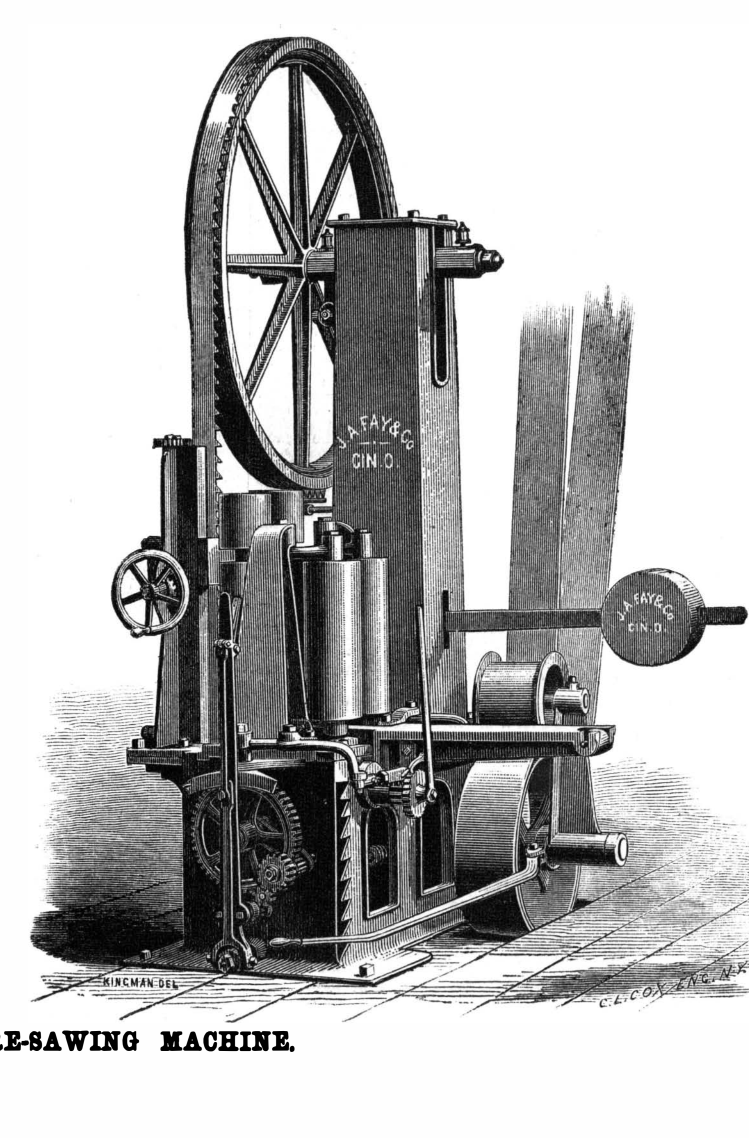


Fig. 2.



J. A. FAY & CO.'S BAND RE-SAWING MACHINE.

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(Illustrated articles are marked with an asterisk.)

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LIFE WITHOUT LIGHT.

An interesting discussion has recently taken place in the French Academy of Sciences, on the question of the influence of solar radiation, and of the green matter in the formation of the immediate principles of plant organisms.

M. Boussingault considers this influence to be indispensable, and that, if the solar radiation should disappear, life would be impossible. M. Pasteur on the other hand thinks that life might still continue in certain inferior plants and occasion the most complete organic growths. He cites as an example the life of the *mycoderma aceti*, which may take place in darkness on a liquid composed of alcohol, acetic acid, and mineral phosphates, the latter including phosphate of ammonia.

The *mycoderma aceti* to which M. Pasteur alludes is a remarkably curious organism, which serves as a medium between the oxygen of the air and a combustible body or fermentable matter, to produce combustion or oxidation. Fermentation of this kind has thus a special character, and differs from that set up by yeast or in other ways. The *mycoderma aceti* appears as continuous membrane, either wrinkled or smooth, upon the surface of liquids while the same are undergoing acetic fermentation, and is generally formed of very minute elongated cells whose diameter varies from 0·000059 to 0·000118 inch. These cells are united in chains or in the form of curved rods. Multiplication seems to be effected by the transverse division of the fully developed cells, which division is preceded by a median constriction. If we allow this cryptogam to develop itself on the surface of any organic liquid containing phosphates and nitrogenous organic matter, until the whole surface of the liquid is covered: then if we remove the liquid without disturbing the membrane, and substitute an equal volume of water containing 10 per cent alcohol, the plant immediately sets up a reaction between the alcohol and the oxygen of the air. After a certain time the action, impeded by the great acidity of the liquid, becomes slower; but we can restore it to activity by substituting alcoholized water again. So that, as long as the *mycoderma* is supplied with suitable nutrition, it will go on and burn the alcohol; but if on the contrary we deprive it of nourishment, or in any wise diminish its vital activity, then its oxidizing action will not go so far, and the alcohol may change into acetic acid. This is the substance of one of M. Pasteur's most brilliant investigations, among the practical results of which is a new commercial method for the acetification of fermented liquids. The process consists in sowing the *mycoderma aceti* on the surface of liquor containing 2 per cent of alcohol, 1 per cent of vinegar, and traces of alkaline and earthy phosphates. When the surface is covered with membrane, the alcohol begins to acidify. This action being fully set up, some alcohol, wine, or beer mixed with alcohol is added every day to the liquid in small quantities; the acetification is then allowed to terminate, and the vinegar is drawn off. The membrane is collected, washed, and employed for a new operation.

M. Boussingault's reply to the suggestion of the *mycoderma* by M. Pasteur is that it is true that some parasites attain a complete development in an artificial medium containing nothing but definite and crystallized chemical compounds. Still there is a great difference between this development and that of chlorophyll in plants. The latter take all their elements from the exterior world, carbon from the atmosphere, hydrogen and oxygen from water. The parasites, even those mentioned by M. Pasteur, take carbon in substances which, although of definite chemical construction, are derived from vegetable organisms. Alcohol and acetic acid have their origin in sugar, which cannot be formed save under the influence of solar radiation. The existence therefore of parasites in an obscure place, where their cellules form immediate principles, similar to those produced in bright daylight by plants of green protoplasm, is far from being an exception, as has been affirmed, but is rather a confirmation of the necessary relation of light and vegetation. Hence M. Boussingault adheres to his opinion that, if the sun's light were quenched, not only chlorophyll plants, but also those deprived of chlorophyll, would disappear from the earth.

M. Pasteur's position appears, however, to be unassailable, as might well be expected from his immense experience and wide investigations touching the subject under discussion. He simply points to the fact that, by known methods of synthesis, chemists starting with carbon and watery vapor can produce alcohol, acetic acid, and many other substances capable of serving as carbonated aliment of inferior plants deprived of light. Moreover it may be conceived that, under the influence of the same, all the carbon existing at the surface of the earth or in the interior might pass into complex organic matters, and that ulteriorly it would return to the atmosphere in the form of carbonic acid through the actions of oxidation and fermentation. It would be only when this termination was reached that all manifestation of life would be impossible without the aid of solar light.

M. Pasteur's experimental determination that oxygen and light are not essentials of life, and his having caused organisms to exist in an atmosphere of carbonic acid and in absolute darkness, are among the greatest triumphs of modern chemistry.

THE ORACLES OF ANCIENT GREECE.

As the classical authors inform us, there were in ancient Greece, in different localities, so called sibyls, a kind of fortune tellers, clairvoyants, or spiritual mediums, but of a social standing much higher than that of their successors at the present day, as they were not only recognized but maintained by a wealthy and influential priesthood, to whom the presents received from the faithful believers were a source of enormous revenue. In our present state of society, we can scarcely form an idea of the power and influence of the priests as a separate class of society, monopolizing as they did all the profits derived from the superstitious, who wished to atone for their sins, to obtain knowledge not only of secret events, but also of the future, and to get advice as to their action in cases of difficulty, even to be cured of various diseases; and thus the priests monopolized, for many centuries, the functions of many professions, even that of the physicians, which Hippocrates at last succeeded in rescuing from the power of the priesthood.

These sibyls, of which the two prominent ones were the Cumæan and the Delphian, resided in gorgeous temples erected over caves, from which vapors arose which had an exhilarating and anæsthetic influence, similar to that of nitrous oxide or laughing gas, on those inhaling them. The author of a well known book, entitled "Art Magic," who for some time lived at the locality where the Cumæan sibyl once resided, states that it is one of the wildest, grandest, and most awe-inspiring gorges of the mountains around Lake Avernus, which itself is the inundated crater of an extinct but once mighty volcano; while the whole region around, now fertilized by the waters of the lake, bears the marks of the ravages of fire, presenting a most gloomy appearance. The clefts in the savage rocks abound with caverns, exhaling mephitic vapors and bituminous odors. The scattered inhabitants of the surrounding district once believed that the largest grotto was the entrance to the lower world, and that the hammers of the Titans, working in the mighty laboratories of the Plutonic realms, might be heard reverberating through the sullen air. The dark waters of Lake Avernus were supposed to communicate directly with the silent flow of the river of death, the Lethean stream, made dreadful by the apparitions of condemned spirits, who floated from the shores of the lake to the realms of eternal night. In this grotto resided the famous Cumæan sibyl; and from the exhalations, which were more or less poisonous to birds and other small animals which came near, the weird woman appears to have derived that fierce ecstacy in which she wrote and raved about the destiny of nations, the fate of armies, the downfall of kingdoms, and the decay of dynasties. Even monarchs and statesmen often acted according to her pretended revelations, as it was supposed that the purposes of the pagan gods were made known to her as to a counsellor and a mouthpiece.

She sometimes wrote her soothsayings upon palm leaves, which she laid at the entrance of the cave, suffering the winds to scatter them and bear them whither the gods directed. To the Cumæan sibyls is attributed the authorship of the famous sibylline books, of which many strange stories are told, but of which very little is left that can be regarded as genuine. It is said that she foretold the eruption of Vesuvius, in which Pliny perished and the cities of Herculaneum and Pompeii were destroyed. She declared of herself: "Why must I publish my song to every one? And when my spirit rests after the divine hymn, the gods command me to prophecy again, so that I am entirely on the stretch, and my body is so distressed that I do not know what I say; but the gods command me to speak." If we substitute in the latter expression the word spirits for gods, we have a declaration identical with those of the spirit mediums of the present day.

The abode of the Delphian sibyl or Pythia was in strong contrast with that of the Cumæan oracle. It was situated in the delightful region of Mount Parnassus, sparkling in sunlight and fragrant with bloom. The superb temple of Apollo was built over a similar chasm as that where the Cumæan sibyl held her *séances*, so that it was secured from the approach of the vulgar. On its former site certain clefts in the rock are still visible, one of which forms a deep cavern, into which travelers, by clinging to its rugged sides, may descend as far as they dare. They then experience effects similar to those produced by nitrous oxide or laughing gas; and one writer, who has explored these caverns, asserts that it is this gas that produces the effects spoken of. This, however, is, according to geological principles, highly improbable; and we rather suppose it to be some bituminous vapor, which (according to our present knowledge concerning petroleum and its derivatives, such as naphtha, ether, rhigolene, chymogene, etc.) has an effect, exhilarating, hypnotic, and anæsthetic, similar to that of nitrous oxide. All the descriptions agree that bituminous odors are exhaled from these volcanic chasms. Plutarch informs us that the most celebrated Pythia who served the Delphian oracle in the temple of Apollo was a beautiful young country girl from Libya, named Sibylla. From this was the name sibyl derived, and it was afterwards given to all clairvoyants of her day. Plutarch further says, concerning the first sibyl: "Brought up by her parents in the country, she brought with her neither art nor experience, nor any talent whatever, when she arrived at Delphi to be the oracle of the gods;" and further, he says: "The verification of her answers has filled the temple with gifts from all parts of Greece and foreign countries." How very much like the innocent young mediums of today, who are often claimed to give the most astonishing revelations from the other world without ever having had the advantages of a scientific education! The sibyls of the ancients had, however, the advantage of the support, assistance, and promptings of a class of men highly interested in their reputation, the priesthood of the period; and this class not only consisted of the most educated individuals, but of men who had the greatest opportunity of obtaining information withheld from the vulgar.

When we compare with this state of things the position of our mediums now, who obtain little support from the telligent, and none among the priesthood of the present day, we cannot help being surprised at their success and the number of their dupes: our surprise is chiefly at the ignorance and credulity of those who patronize such things in the nineteenth century.

CAMS.

There are several devices in mechanics which are important and even indispensable, that are used under protest. In this class we have irregular cams, at once the most useful and the most abused things in the mechanical world.

There is not a loom deftly weaving its delicate designs which is not dependent on cams. Sewing, knitting, and printing machines, a host of ponderous as well as delicate machinery, depend on cams to give one movement here, and another there; yet after all a cam which is in perfect proportion in all its parts is rarely seen. It is no uncommon thing to see a lever provided with an infinitesimal friction roller which is intended to turn on a pivot four fifths its size. This little roller must fit a groove in a cam which revolves at such speed as would drive it at the rate of thousands of revolutions per minute, if it would revolve; but the oil is forgotten, it heats, sticks, cuts itself and the cam; and then comes lost motion, noise, and destruction to the machine. Perhaps a larger wheel or roller is used, for instance, on the periphery of a cam. This wheel is a mere disk, with a hole bored through the center. It is placed on a stud on a lever, and assigned to a duty as heavy as that of the shaft which carries the cam. Is it any wonder that it soon wabbles, cuts the cam, and works unsteadily?

Of course the remedy for this is obvious. The rollers should be made as large as possible, of good material and well hardened. The roller bearings should be of the proper proportion and well fitted, and provided with some means of continuous lubrication.

The cam should be smooth, without the slightest scratch or cut, and should be made as far as possible so that it will not catch dust and dirt. If any part of a machine needs cleaning often, it is a cam; yet it is not an unfrequent thing to see a mass of gum, lint, and grit stowed away in a cam, cutting away its usefulness.

BAROMETRIC OBSERVATIONS.

In a recent issue we briefly described a simple way of keeping a barometric record, by the aid of which farmers and others might soon learn to predict weather probabilities. We believe that it is not generally realized how useful an instrument the barometer is, even in unexperienced hands; for certainly were farmers thoroughly informed as to the meaning of its indications, we should hear much less of gathered crops spoiled by untimely and unforeseen rains. The ordinary mercury barometer can if properly constructed generally be relied upon to indicate approaching weather at least twelve hours ahead; and this because the transmission of pressures to a mass of air is very easy, so that the barometer is sensible to variations therein even over long distances. For good work the simple mercury or the aneroid barometer should be obtained. Little confidence can be placed in those which have a dial and an index which points to words descriptive of the state of the weather. The necessary mechanism causes sufficient friction to prevent slight changes of pressure affecting it, and moreover the words "fair," "variable," rain," etc., convey a wrong impression of the instrument; for the barometer does not indicate by the absolute hight of the mercury, but, by its rising or falling, the kind of weather we are to expect, and this change is not shown on the index. A diminution of barometric pressure is almost always the consequence of the approach of the center of one or sometimes of several rotary storms, which move and travel at a certain distance from the point of observation. These movements are followed by changes of winds which carry rain. A falling barometer is therefore always indicative of changes in weather; but contrary to a general opinion, rain does not fall at the moment when the barometric column attains its lowest point. It is only a certain time after the minimum that this phenomenon is ordinarily pronounced; and by repeated observations, based on this fact, M. Gobin of Lyons, France, has been enabled to prepare a series of concise barometric laws, which he has recently published and of which we give the substance below.

If the barometer, after having been high, descends, a change of wind will probably occur twelve hours afterwards. This change will be without rain or with very little rain. When the barometer stops in its falling without descending lower before rising again, rain will come twelve hours after the stoppage. If the mercury remains low, the rain will persist, and fine weather will not come again until ten or twelve hours after the column commences regularly to rise. Sometimes this interval extends to sixteen or eighteen hours, but this is rare.

If, while low, the mercury oscillates slightly up and down, bad weather will persist, with, however, occasional clearing. These alternations of rain and shine will be more pronounced as the oscillations are greater, and will follow the movements of the barometric column at shorter intervals than those noted in the law above given.

Finally, if, as often happens, the mercury, after reaching its lowest point, immediately ascends in a continuous and regular manner, rain will come inside of twelve hours after the mercury touches the minimum; but it will last but a short time, and will soon give place to fine weather.

A GOOD coating for outside brickwork is made by mixing clean river sand 20 parts, litharge 2 parts, quicklime 1 part, and linseed oil sufficient to form a thin paste. It is also useful as a cement for broken stone, drying exceeding hardly.

THE CENTENNIAL EXPOSITION.

The formal programme of the grand ceremonies, to take place in Philadelphia on July 4, has been made public. After the military parade has concluded, the literary exercises will be held on a large platform in rear of Independence Hall. They will include the reading of the Declaration of Independence from the original document, by Mr. Richard Henry Lee, of Virginia, grandson of the mover of the Declaration in the Continental Congress, the singing of a hymn of welcome by Dr. O. W. Holmes, a national ode by Mr. Bayard Taylor, and a Brazilian hymn of greeting, composed at the request of Dom Pedro. An oration by Hon. W. M. Evarts, which is next in order, will be followed by the Hallelujah chorus and Old Hundred, chanted by the chorus and audience. The proceedings are as simple as those at the Centennial Exhibition opening, and will doubtless be fully as impressive.

Dom Pedro is justifying his reputation as a most indefatigable sight-seer. He is "doing" the Exposition in a way that leaves no doubt but that he makes himself familiar with the appearance and uses of every object to which his attention is attracted.

The steady growth thus far in attendance is the best evidence of increasing interest in the fair. During the first week, omitting the opening day, the average of paying visitors was 12,210; at the present time the daily average is over 30,000.

The first of what it is hoped may be a series of industrial excursions recently visited the Exposition. The excursionists numbered 3,631, and were the employees of the Singer Sewing Machine Company. A number of students from the Massachusetts Institute of Technology have been encamped on the Pennsylvania University grounds for some time past, and, with their instructors, are making a careful study of the mechanical part of the show. The display of

RUSSIA

in Machinery Hall is gradually approaching completion. A large partition has been erected, covered with cloth, on which are shown rolls of iron and copper; and a circular stand has been built for the exhibition of different iron and other ores and metals. Around the base of the stand and on the lower shelves are disposed samples of iron and copper. A heavy slab of the latter metal, surmounted by a beautiful mass of malachite, covers the upper portion. There are two other stands in the form of obelisks, against which are arranged in tasteful manner a large number of forms of sheet, bar, and angle iron, boiler iron, and tram and chain work. Numerous stout iron bars are tied into knots without showing the slightest flaw; and specimens of angle iron and long rails are exhibited, twisted into sharp spirals. In the northern half of the section is a fine collection of models of ships, dockyards, and workshops. There is one large model of a shipyard and marine railway, showing the manner in which the largest ships are built and launched. A model of a dry dock is fitted with every timber and requisite piece of machinery, all made on an exactly reduced scale. A fine exhibit is made of heavy work in iron and steel, chains with huge links three or four inches in thickness, steel tires for locomotives, and heavy arched beams of angle iron.

THE SUGAR APPARATUS,

next to the Corliss engine, may be considered as the most prominent exhibit in the Machinery Hall. The gigantic vacuum pan is elevated on great iron columns, three stories high. Inside are four copper serpentines, and into these steam is led. The circulating pump and the centrifugal machines are placed on the first floor. On the second floor is a large receiver which receives the contents of the pan after concentration, in the shape of a dense mass of semi-fluid material, a magma. This goes into the centrifugal machines, which separate the sugar from the molasses. The great vacuum pan is exhibited by Messrs. Colwell and Brother, of New York; it is 8 feet in diameter, and, in a single operation of three hours in duration, can produce fifteen hogsheads of sugar.

THE CARRIAGES

are grouped in an unpretending structure of corrugated iron, immediately in rear of the Main Building. There are 430 American and 20 foreign exhibitors, and the display seems to be one of the most attractive to the general public in the entire fair. Many of the vehicles embody novel appliances, others are remarkable for beauty of finish. Messrs. Brewster & Co., of Broome street, this city, besides a superb display of carriages of all kinds, exhibit two buggies for one and two persons which weigh respectively but 132 and 214 lbs. These have a new side bar attachment, which secures ease of travel. A new feature in one of the sleighs is a small wire sieve on the dash to keep out drift snow. Another novelty is the extension of the runners above the dash for a hight of five and a half feet. These are surmounted with red horse plumes. The general effect is striking and handsome. Messrs. Studebaker Brothers, of South Bend, Ind., exhibit a wagon for country roads, with the body and running gear left unstained, in order to show the workmanship, which is excellent. The body is of sugar maple, the axle of hickory, and the hubs of birch. The same firm also display a new wheel, the spokes of which have sloping shoulders, in order to fit them for resisting greater strain. Two Philadelphia firms make a joint exhibit of carriage and harness. The former is plain and handsome. The visitor is attracted to this display by the ingenious idea of attaching to the vehicle four horses, superbly carved in wood and wearing an elegant gold-mounted harness. The animals are painted gray, and so cleverly have both artist and sculptor done their work that at a short distance the figures have been frequently mistaken for life. Of the large American coaches and carriages, it is hardly necessary to particularize any on the ground of relative superiority. Their characteristic is lightness and elegance of form, combined with the evidences of the highest skill on the part of painters and varnishers.

THE FOREIGN VEHICLES

are exhibited chiefly by English, Canadian, Russian, Australian, and Italian makers. Some of the English carriages, notably the drags, are objects of much curiosity to country visitors. One vehicle of this last-mentioned description is built expressly for picnic parties. It is so put together that the various portions of the carriage and fittings form tables, and the roof is fitted with an ingeniously arranged sun shade. A novel phaeton is one which has recently been introduced into England, and which looks like a Russian droshky. It is hung very low on high wheels. A very elegant brougham, built by a London firm, has an edging of vulcanite on the cloth of the window sashes, which prevents wear. C and under springs are used in all the English carriages, and the tires of wheels and forgings are of Whitworth metal. The Italian makers are represented by two cabs, resembling the English hansom, except that the passenger gets in from behind instead of in front. The driver's seat is in rear and above the door.

A curious feature of the Russian exhibit is a light trotting wagon. The running gear is hung on four small wheels, and above it rests the driver's seat, a long board covered with blue plush. A greater contrast than that afforded by this wagon, as compared with the trotting sulky in use in this country, can hardly be imagined.

Canada exhibits some fine sleighs, among which is one capable of accommodating six people. The seats are placed in tiers, the front one being the highest and the others gradually descending. The body is hung on a double set of runners, in order to facilitate turning the vehicle. There are also some fine cutters, beside coaches, buggies, etc.

The French exhibit, for some inexplicable reason, is located in the Main Building. It includes a drag of admirable build, besides a large number of smaller carriages, all remarkable for elegance of design. The

CARRIAGE METAL WORK

exhibited embraces specimens of axles, bolts, screws, whip sockets, springs, mountings in gold, silver, and nickel, bows, curtain attachments, etc., all arranged in handsome cases. There is one German exhibit in this section, principally of axles and springs. Children's carriages are also displayed in profusion, and some are of exquisite design. There is also a large collection of bicycles, among which is

A DOG VELOCIPEDE

This is a curious affair, having three wheels, two large ones, between which the rider's seat is located, and one small guiding wheel in advance. Inside the fellies of the large wheels are broad bands of perforated metal, and the spokes are so disposed as to lie on each side of these bands, like the bars of a cage. It is stated that the dogs are placed between the spokes and on the bands; then, by their attempts to run ahead, something like those of the squirrel in its revolving cage, the wheels are rotated and the vehicle impelled. This is the description given, but we are inclined to doubt the practicability of the arrangement.

THE RAILWAY CARS

are all American. The Harlan and Hollingsworth Company, of Wilmington, Del., exhibit one broad and one narrow gage carriage. The broad gage car is superbly decorated with mirrors and gilding, and its interior woodwork is a marvel of artistic workmanship. The narrow gage car is of plainer construction. The Jackson & Sharpe Company display a parlor car built for the state use of the Emperor of Brazil. It is constructed in sections, so that it may be taken apart and stored in the hold of a vessel. In the front portion is a boudoir fitted up with drab morocco seats, relieved by heavy magenta-colored fringes. The carpet is a delicate drab covered with a tasteful flower pattern, and the curtains are green and gold. The furniture consists of elegant cabinets, one for books, another to serve as a sideboard. Light is obtained from small stained glass windows at the top. Adjoining the boudoir are a reading room, furnished in blue, and a writing room in crimson. Next to these is the sitting room, plainly fitted with cane-seated walnut chairs, but having superbly inlaid woodwork.

The Pullman Car Company exhibits one of its magnificent hotel cars, containing all the improvements in the shape of kitchens, china and linen closets, refrigerators, etc. The refrigerator, we notice, is a square box hung under the car. Another new feature is a large flange on the wheels, which, should the vehicle run off the track, will catch on the rail and prevent its going further.

THE STREET RAILWAY CARS

are finished with decorations of the most elaborate description. One built by a Boston firm has a new running gear, said to reduce friction greatly, a patent attachment for putting on a new brake shoe, and a novel arrangement for lowering and raising the pole to suit the varying size of horses. A noticeable feature of a car built by Jones & Co., of Troy, N. Y., is the exterior coloring, which is in imitation of one of the Highland plaids, laid on in a broad band around the body. This is done in deference to the fact of the car being intended for use in the Highland district of Boston. Messrs. Stephenson & Co. also display some street cars, embodying many of their recently patented improvements.

The remaining contents of the carriage building we shall describe in our next issue, in which a full account of the Fourth of July ceremonies will also appear.

A NEW MECHANICAL MONEY BOX.

A variety of curiously ingenious money boxes for children have, of late, appeared in the hardware and toy stores, which, it seems to us, must tend to cause the average youngster to lay up immense stores of pennies, if only for the satisfaction of seeing the toy operate whenever a coin is inserted. There is a metal frog into whose mouth the penny is put, whereupon he gulps down the coin and rolls his eyes in the most astonishing manner. Another device is so constructed that, when the penny is dropped in the slit of the box, two or three tin horses proceed to race around a miniature race track; still another is the figure of a portly individual seated in a chair. The coin is placed in his hand, whereupon he promptly inserts it in the slit which is located in the position of a coat pocket. About the most ingenious invention of the kind we have yet seen is that herewith illustrated. It was patented by Mr. C. C. Johnson, of Windsor, Vt. The penny is placed on the tray held by the miniature cashier outside of the house, and the weight is just sufficient to press down the platform on which the figure stands. The arm, in descending, strikes the pin of a locking device beneath it and frees a spindle which, operated by concealed clockwork causes the cashier to be carried round in a circle against the door on the left, which opens before him so that he can enter the bank, and then closes behind him. He carries his receiver through the slot of a chute, a lip on which removes the coin so that it drops down the chute and into the vault below. Then the cashier moves round against the other door, which opens outward and closes as he passes, and coming again to the front of the bank he is again held by the locking device, waiting for the next contribution

The Fair of the American Institute.

The 45th annual exhibition of the American Institute will open on the 6th of September next, at the Institute building, corner of 63d street and Third avenue, in this city. The management announce unusual preparations to accommodate exhibitors, and also the fact that a new gold medal will be awarded for articles of great merit and novelty. It is thought that the influx of people to the Centennial will render local fairs in its vicinity exceptionally valuable for advertising purposes to exhibitors. Application for space, etc., is to be made to the General Superintendent, American Institute, New York city.

TRIMMING AND PUNCHING ROOFING SLATES.

Mr. E. R. Davis, of Detroit, Mich., has patented (Dec. 21, 1875), a new machine with which a roofing slate may be trimmed and the nail holes punched at a single operation.

In the engraving herewith given, A is the main frame, to which the cutting frame, B, is hinged. CC' are two bearers, adjustably secured, so that they can be adjusted to or from each other, according to the width of the slates to be trimmed. The bearer, C', has one side turned up, as at C², forming a guide flange for one side of the slate, which is laid against it. A guide is adjustably secured to the front girt between the bearers. The outer edges of the beveled ends of the bearers are flanged upwardly, and sharpened to form cutting edges, *b*. The cutting frame is composed of two parallel iron bars set up edgewise, bent to form three sides of a frame, with spacer blocks between the bars, which are tied by bolts through the said spacer blocks. The cutters, EE, are adjustably secured under the frame diagonally across its corners, so as to bring their cutting edges just outside the cutting edges of the bearers below. F is a handle across the front edge of the cutting frame, which can thereby be lifted up or thrown forcibly down, the impact upon the front girt of the main frame being eased by rubber buffers.

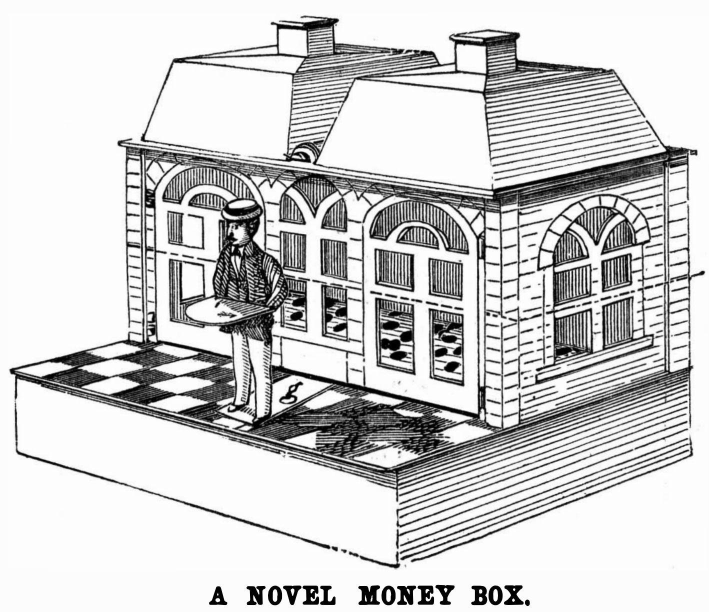
To trim a slate the latter is laid on the bearers, one edge bearing against the guide, C², and the front end against the guide, D. The cutting frame is then thrown down, when its knives will shear off the corners of the slate in line with the cutting edges, *b*, of said bearers. To punch the nail holes in the slate at the same operation each bearer is provided with an anvil, G, longitudinally adjustable in a slot therein, each anvil having an oval hole through it. Across the top of the cutting frame a cross beam, H, is jacked, said beam being constructed like the cutting frame of two parallel iron bars set up edgewise, and may be moved forward or back by loosening its jack bolts. I are nail hole punches, each having a screw shank which is inserted up through the slots of the cross beam, where it receives a wing nut, I', which secures it in position to have the point enter the anvil hole, first passing through the slate. A spring, J, spirally coiled about the punch, forces off the slate when the punch is raised.

Export of Cotton Fabrics and Breadstuffs.

The exports of domestic cottons from New York to foreign ports in one week, recently, were over 1,000 packages, which bring the total, from the 1st of January, up to 31,500 packages. The shipments of grain are enormous. Last week's exports were of wheat, 13,023,300 bushels, corn, 409,546 bushels, besides a fair quantity of peas, rye, and oats. The prospect of war in Europe has stimulated the grain trade.

Separating Paraffin from Hydrocarbon Oils.

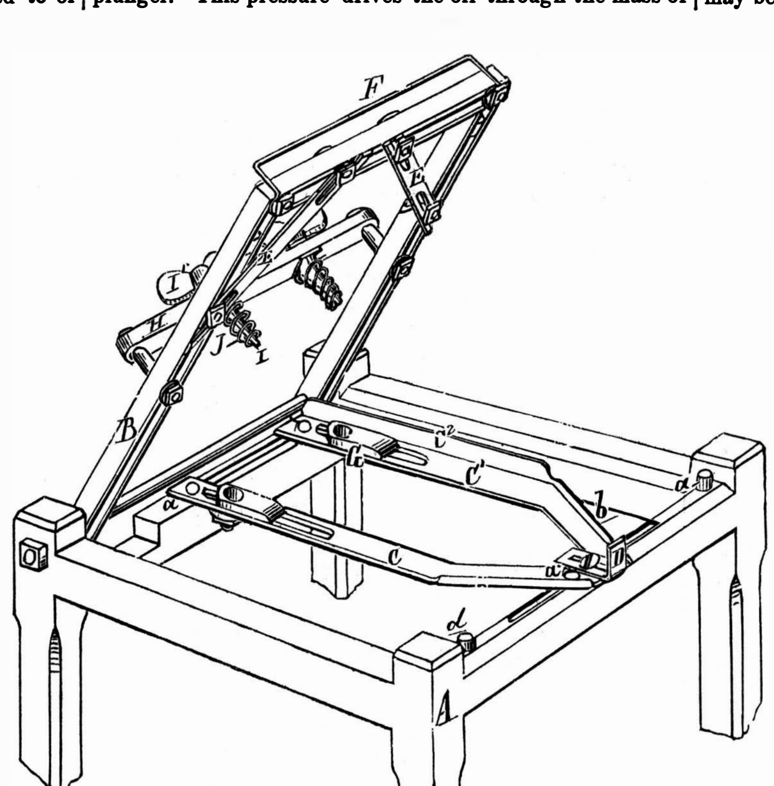
Mr. Joseph B. Meriam, Cleveland, O., says: "Heretofore paraffin has usually been removed from hydrocarbon oils by putting the material into sacks or folds of canvas, or folds of hair cloth, etc., and then subjecting to pressure at a low temperature. The difficulty, however, in those processes was that, the heavier the pressure that was applied, the more open would the pores of the bags or sacks become, and the more readily would the paraffin pass through them, rendering it almost impracticable to make a thorough separation.



A NOVEL MONEY BOX.

"I have discovered that the scales of paraffin that are thus left, after thus extracting the oil by pressure at a low temperature, are separate and distinct, and, except under the application of heat, cannot be, by ordinary pressure, reduced to an impervious mass; and I make use of this property as follows, for the purpose of separating the paraffin from oils.

"I first take suitable receptacles, preferably of metal, protected by a non-conductor of heat, which receptacles have perforated bottoms. I then place over the bottom on the inside a wire gauze, screen, or cloth to prevent the scales of paraffin from falling through. I then fill in upon the said screen a quantity of paraffin scales that have been separated from hydrocarbon oil by pressure under a low temperature, as above described. The hydrocarbon oil to be treated is then prepared as follows: It is first reduced to a low temperature, sufficiently to chill it, and leave it in the condition termed granulated. This oil, in its chilled, granulated condition, is then put into the vat upon the paraffin scales, and then subjected to a pressure under a low temperature, in any convenient way, as, for instance, by a plunger. This pressure drives the oil through the mass of



DAVIS' MACHINE FOR TRIMMING AND PUNCHING SLATES.

paraffin scales, which filters from it the paraffin that may be contained therein. The greater pressure applied, the more closely will the paraffin scales be pressed together, and the more perfectly will it filter the paraffin from the oil that is being operated upon. In this way I am enabled to make an almost perfect separation of the paraffin from the oil, thus leaving the oil in a practically pure condition."

PHOTO-CHEMICALS.

BY EDWARD DUNMORE.

Gallic acid, obtained from nut galls, consists of small, feathery crystals, nearly white, but which, however, vary in color, some samples being decidedly brown. Preference should be given to the more colorless sample for photographic purposes. It is freely soluble in hot water, but in cold about four and a half grains will form a saturated solution in one ounce of water. The reason of the much greater activity of a hot saturated solution in development will be at once apparent.

Pyrogallic acid, or pyrogallol, occurs in white, brilliant crystalline plates, massed together in light, cottony masses, which, by exposure to the air and light, gradually darken and, in some measure, lose their photographic activity. Colorless samples should, therefore, be selected. It may generally be relied on for purity. The writer was once accidentally supplied with benzoic acid in lieu of pyrogallic, which it somewhat resembles in appearance; but the substituted acid will be readily detected by its aromatic odor.

Nitric acid should be colorless, and the upper part of the bottle containing it free from red vapor. Its specific gravity is about half again as heavy as water. It is very corrosive, staining the skin yellow, and must be very carefully handled, as its corrosive action will give rise to very troublesome sores. The fact of its producing a yellow stain on many organic substances—a quill, for example—may serve to distinguish this acid from most others.

Sulphuric acid is a colorless, heavy liquid, having great attraction for water, and should be stored in well stoppered bottles. If kept in corked vessels it will soon become dark in color from portions of the cork becoming decomposed and falling into it. Any organic matter will cause rapid darkening, and there is most violent reaction when it is mixed with turpentine and other hydrocarbons. Its chief use in photography is in the preparation of pyroxylin, and as a detergent for removing organic and alkaline deposits from glass vessels.

Hydrochloric acid, when pure, is colorless, giving off white fumes on exposure to the air. It may be readily distinguished from other acids by the dense white vapor which forms on its fumes mixing with those of ammonia. The commercial acid is of a yellow color and contains many impurities, but is sufficiently good for the purpose of precipitating solutions of nitrate of silver. Diluted with water, it readily removes stains of the alkaline developer from the hands and ink stains from wood or other materials.

Aqua regia, or nitro-hydrochloric acid, is a mixture of one part of nitric with three or four parts of hydrochloric acid, and is used for dissolving gold in the preparation of the chloride of that metal.

Bicarbonate of soda, often purchased as carbonate of soda, is a white powder and useful for many purposes, culinary and scientific. The quality varies considerably; that known as "Howard's" is considered as the best preparation, being more soluble than the common variety. It is often called carbonate of soda, an appellation only correct when applied to the preparation known as washing soda, or this in its purified forms.

Morphia acetate is an alkaloid obtained from opium, and may be purchased as a dirty white crystalline powder, which inflames like resin. It is a dangerous narcotic, but useful in the preparation of dry plates with very limited keeping powers.

Alcohol, or spirit of wine, is a colorless, volatile liquid of a strength of 56° to 60° over proof, suitable for addition to the above developer, varnisher, etc. A more highly rectified quality, termed absolute alcohol, is used in the preparation of collodion, or for diluting the same. The only difference or probable impurity in proof spirit, rectified spirit, or absolute alcohol, is the percentage of water contained in it. A rough method (if the hydrometer be not at hand) of estimating the strength is by watching the rapidity of its evaporation. On a slip of note paper being dipped into it and suffered to dry spontaneously, if the spirit be tolerably free from adulteration, evaporation will take place rapidly; but if much diluted, it will be some time before this takes place.

Rectified ether is an extremely volatile, colorless fluid, boiling at a low temperature, and not miscible with water unless mixed with spirit of wine. Spirit of ether is occasionally supplied in lieu of the rectified ether, and consists of a solution of ether in spirit of wine. The mixture may be readily detected by adding a few drops of spirit of turpentine, which will cause no turbidity if the ether be pure, but will do so if it contain spirit of wine.

Methylated spirit: This should be nothing more than spirit of wine with an admixture of wood naphtha; but it is often impure from the presence of resinous and other matters. Methylated finish is sometimes sold for it, a preparation utterly unsuitable for photographic use, containing, as it does, a large percentage of resinous matters. Good methylated spirit should, if burned in a spirit lamp, form no incrustation whatever round the wick tube, and should not be more than slightly opalescent if mixed with water.

Ammonia: The sesquicarbonate of ammonia, or volatile salt, occurs in semi-transparent lumps of various sizes. Access of air will cause them to be converted into another carbonate, of an opaque white, powdery character, and of less active chemical qualities. Lumps free from this powdery surface should be selected, and the vessels in which it is kept made airtight. It is a good precaution never to reduce it to powder until just before use, as in a state of fine division it is more liable to become inert.—*British Journal of Photography.*

IMPROVED WAGON BRAKE.

The annexed engravings represent a new wagon brake patented through the Scientific American Patent Agency, April 25, 1876, by Mr. J. W. O'Daniel, of Cloverdale, Ind. The novel features are found in the mechanism, and principally in the devices which allow the levers for working the brakes to remain undisturbed by the oscillations of the same, as shown in Figs 1 and 2.

The joint by which the front and hind gears are coupled, so that both may oscillate in turning around curves, consists in a tubular nut swiveled to the rear bar, B, of the front gear, and a rod, C, attached to the rear hounds, sliding freely in said nut. The rod is extended both before and behind the nut, so that it may move therein as the distance between the centers of the reach varies. The brake bar, H, is carried on the hounds so as to oscillate with them and the wheels. It is arranged to move forward and backward suitably for engaging and releasing the wheels, and is connected by a bar with the lever, K. Said bar connects with the pivot, E, by a slot, so that it can slide to pull and push the brake, and with the lever, K, by a curved slot and pin, so that it can swing with the wheel. The lever is pivoted to an arm, O, fitted on the reach, and, as already stated, remains at all times in the same relation to the box.

Fig. 1.

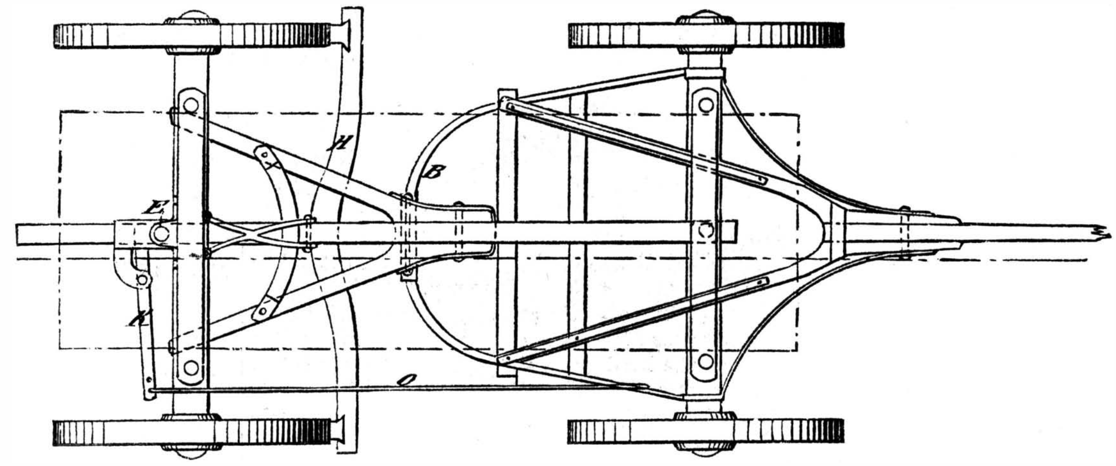
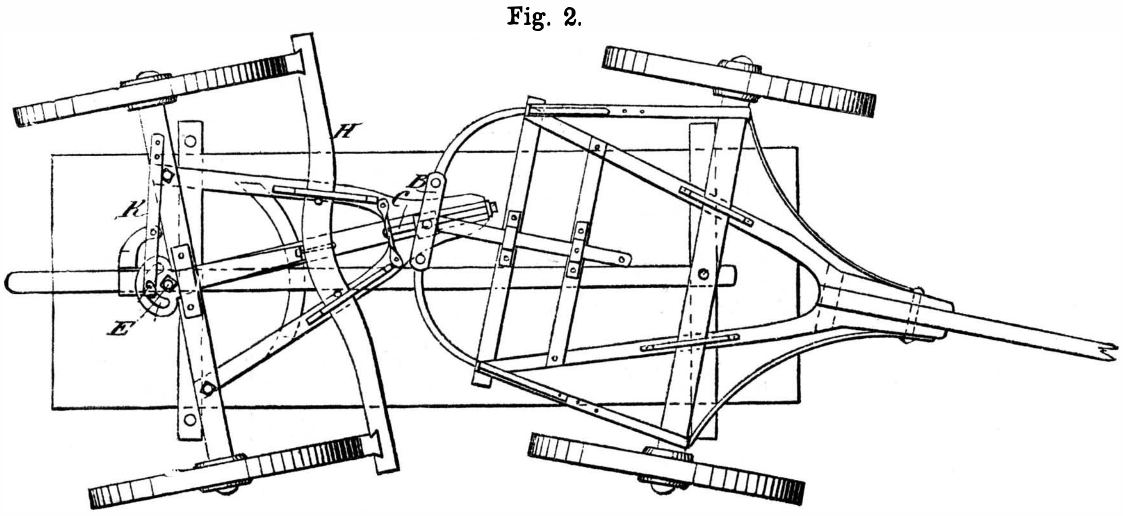


Fig. 2.



O'DANIEL'S IMPROVED WAGON BRAKE.

Bergen Hill Minerals.

The new tunnel of the Delaware and Lackawanna railway, through the trap rock formation of Bergen Hill, opposite New York city, is now nearly completed. Mr. Edward H. Fletcher, 124 West 54th street, this city, obtained a quantity of specimens of zeolites and calcites, taken from pockets in the tunnel, at depths of 50 to 150 feet from the surface. They comprise apophyllite, prehnite, laumontite, natrolite, pectolite, stellite, stilbite, analcime, datholite, and fine varieties of calcites. Intergrouped with some of these, are also chabozite, heulandite, gmelinite, levyne, copper pyrites, iron pyrites, galena, and blende.

IMPROVED RAILWAY RAIL.

The invention herewith illustrated is an improved continuous rail for railways, by which it is claimed that the battering and breaking of the ends of the rail at the joints is avoided, and less wear and injury to the rolling stock produced. In the sectional view, Fig. 1, A represents two rail sections of symmetrical shape, with base flange and head, each rail resembling the section of a common rail split into halves along the longitudinal axis. The rail sections, A, are joined longitudinally and provided with interior recesses for a longitudinal wooden core, B. By laying the sections so as to break joints, battering at the end is avoided and the rails are rendered more durable. The heads of the rail sections are provided with a tongue and groove, which affords mutual support to the adjacent parts, and also prevent the inside corners of the rail heads from breaking. The compound rail thus constructed is claimed to be stiffer and stronger, and smoother throughout, while the wooden center rail or core imparts a certain degree of elasticity to the same. The interior wooden rail is covered on all sides and protected against the weather, so that it may last a long time, and may be replaced when required. While twice as many fish plates will be used, they will only need to be half as long and half as thick as usual, thus effecting a saving of one half the material. The same number of bolts will be required as in the old rail, but they will not need to be so heavy, as at every joint there will be the solid middle of a rail section besides the wood to support it. The principal use of the bolts and the fish pieces will be to hold the parts together, which will not require great strength, as the base is double and stands apart, with the flanges extending outward on either side; the tops will gravitate together, and, the greater the weight upon them, the more they will press together. The inventor points out that his device effects a saving of over a solid inch of iron or steel, which will pay double the cost of extra work required in construction. Owing to the smoothness of the road, he considers that there will be less damage to goods in transportation, and that pleasure and safety in travel will be increased. Less labor will also be required in keeping the road bed level. A side view is given in Fig. 2.

Patented through the Scientific American Patent Agency, February 29, 1876. For further particulars relative to the manufacture and sale of this rail under a royalty, address the inventor, S. Sutton, Lisbon, Linn county, Iowa.

Fig. 1

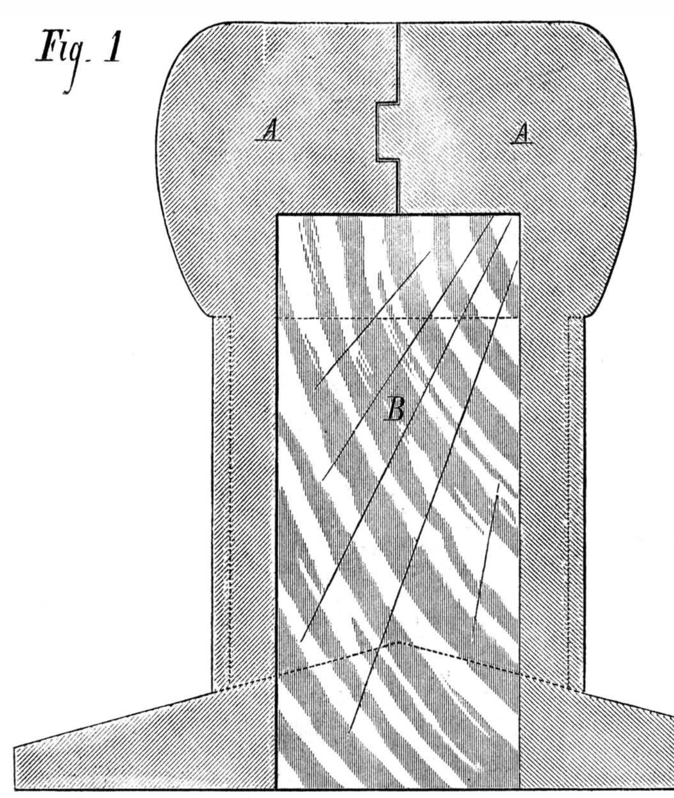
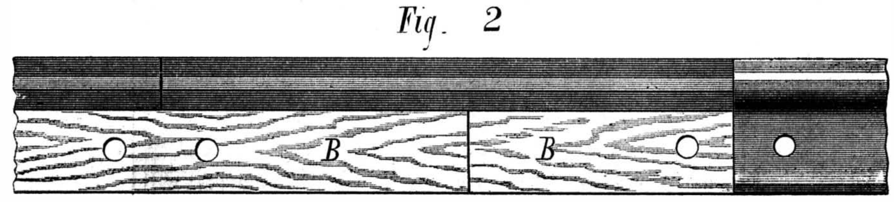


Fig. 2



SUTTON'S IMPROVED RAILWAY RAIL.

An Improvement in the Manufacture of Silver Mirrors.

At a recent meeting of the Paris Société d'Encouragement des Sciences, M. Débray described a new method designed to remove the previously existing difficulties in the way of preparing silver mirrors. From this address we extract the following:

Up to the year 1840, glass mirrors were made exclusively with a backing of tin amalgam. The operation was, and still is, as follows: A sheet of tinfoil weighing 1,000 to 1,140 grains per square foot, is spread out perfectly smooth on a flat horizontal stone; upon this is poured a thin layer of mercury, and then a well polished plate of glass is shoved from one side on to the tinfoil, driving off the excess of mercury. The glass is pressed down against the tinfoil with heavy weights for 12 hours, when the latter becomes sufficiently adherent to the glass. The plate is gradually raised to a vertical position, to allow the excess of mercury to flow off. This last operation, which may be compared to a drying, lasts 8 or 10 days. The necessary quantity of mercury weighs about the same as that of the tin, that is, 700 to 800 grammes per square meter, or 1,004 to 1,148 grains per square foot.

The disadvantage of this process is that the workmen are exposed to the injurious action of mercurial vapors. Attempts have therefore been made to cover mirrors with silver. In 1840 an Englishman named Drayton employed an ammoniacal solution of nitrate of silver, which he reduced upon the glass with an easily oxidizable essential oil, as essence of cloves. The process was modified by different chemists, but was first actually introduced into practice by Petitjean, who employed tartaric acid as reducing agent; and in 1856 he started a silver mirror factory at St. Marie d'Oignies, in Belgium. Liebig's process with milk sugar is not mentioned by Débray. It was first introduced into Cræmer's mirror factory at Doos, near Nüremberg, in 1859. In the Petitjean process, the plate of glass is laid on a horizontal cast iron table with double floor, and heated to about 40° C. (104° Fah.) After being cleaned perfectly, it is flowed first with a solution of nitrate of silver, and then with tartaric acid. In about 20 minutes the silver begins to be deposited on the glass; and in about 1¼ hours, the time varying with the strength of the solution, the silvering is complete. The liquid is then allowed to run off, the mirror is washed with distilled water and dried, and finally the silver film is protected with a coat of varnish.

From 5¾ to 7⅙ grains of silver suffice for a square foot, and 1½ cents worth of silver is enough for a surface that would require 1,000 grains of tin and as much mercury. The great fluctuations in the price of these metals are frequently very embarrassing to large mirror factories. By the new process a mirror can be made in a few hours; while the previous method required at least 12 days, and also required more costly materials. Débray says that this silvering process has almost entirely supplanted the old mercury process. L. Lobmeyr, in his report on glass at the Vienna Exposition, also states that mercury mirrors will apparently soon go out of use.

Silver mirrors, however, always have these objections, that the image is somewhat yellowish, and that the silver does not adhere so perfectly to the glass as is desirable; it often happens, too, that the silver film comes off in spots where it has been exposed to the direct rays of the sun; and finally, notwithstanding the protection of the varnish, the silver gradually blackens under the influence of sulphuretted hydrogen. The latter objection is especially noticed in exporting mirrors across the equator; the mirrors are blackened by the exhalations from the hold of the vessel, where they lie packed for months. For this reason mercurial mirrors, although they frequently suffer much from the heat in tropical countries, cannot be supplanted by silver mirrors; although the latter are proof against injury by heat.

Even if these objections were quite overbalanced by the cheapness of manufacture and freedom from mercurial diseases, it would still be very desirable that they could be avoided. This has now been accomplished in a very simple manner by a Paris engineer, named Lenoir, previously well known through his gas machine. The glass is silvered as before and washed, then flowed with a dilute solution of cyanide of mercury and potassium. This dissolves a portion of the silver and precipitates some mercury, which combines with the remaining silver to form an amalgam, which is much whiter and adheres more firmly to the glass than the silver. The conversion takes place instantly. The quantity of mercury taken up varies with the time that the mercury solution and silver are in contact; in one experiment, made by Débray, he observed that it did not exceed 5 or 6 per cent. The use of the solution, which is itself a very poisonous cyanogen compound, is not dangerous if very dilute; this solution has been in use many years for electroplating, and in much more concentrated form than it is employed by Lenoir, without real injury.

An amalgamated silver mirror does not exhibit the yellow shade of pure silver, is far less sensitive to sulphuretted hydrogen, as two years' experience proved, and resists perfectly the action of the sun. Lenoir's process has been introduced into the mirror factory of Mangin Lesur, at Paris.—*Deutsche Industrie Zeitung.*

Correspondence.

A Singular Railway Collision.

To the Editor of the Scientific American:

In your issue of July 1 you mention and illustrate a singular collision. I notice that the *Graphic* locates the occurrence on the Northwestern Railway. Allow me to call your attention to a remarkable coincidence.

Your engraving, with but few exceptions, represents a collision that occurred on the Falls branch of the New York Central road on the morning of September 10, 1872, between the village of Albion and the city of Rochester, 2½ miles from the former place. Both trains were due at Albion at 3.45 A. M. The eastern bound train was one or two minutes late; but the train from the East not having arrived, the eastern bound train started out (having the right of way) at an unusual rate of speed. In running two miles it made up two minutes. At this juncture the engineer saw through the fog the headlight of the advancing train. He whistled down brakes, and reversed his engine. Only three brakes were set. All on both trains jumped. The engineer of the eastern bound train struck on his head, which stunned him for the moment. He sprained his wrists and bruised his face, but all the others alighted in safety. In an instant the monsters came together, hissing and seething in each other's embrace.

Unlike your illustration, they stood more nearly alike on the track, without smoke stack or bell. The tenders were driven under the rear of the engines, and everything that could be thrown from the engines under such a fearful concussion was gone. The boilers did not burst, but the engines appeared to be total wrecks. I understand, however, that one of them was rebuilt. Six cars left the track, and three more were burnt on the track. The trains were heavy freights, and a great amount of merchandise was burnt or otherwise destroyed and stolen. The loss at the time was estimated at $200,000, but I understand that this was considerably in excess of the fact. Photographers arrived too late for the prize. The engines were quickly separated, and, when disengaged, they rolled some 16 feet down the embankment. The track at the place of accident was smooth and straight. ALEX. D. TYTLER.

Albion, N. Y.

Flax in Missouri.

To the Editor of the Scientific American:

I wish to call the attention of capitalists and inventors to an opening for them out here. I recently noticed along the road between Sedalia, Mo., and Parsons, Kan., that the farmers grew a great deal of flax, just for the seed. They do nothing with the stalk or straw. Why could not this be put to use? I always supposed that there was a great demand in this country for flax, and it looks like a great waste to let all this stand in stacks to rot or be burnt. The only reason for this that I can see is that, in thrashing out the seed, the stalks become tangled together, which may make it difficult to hackle; but our inventors could readily make some machine to overcome this difficulty. There is about 1 ton of flax straw to the acre. The crop is a regular one; many thousands of acres are cultivated every year; and after the seed is thrashed out the straw could probably be bought for a mere song. S. E. WORRELL.

Hannibal, Mo.

[For the Scientific American.]

ANIMAL MECHANISM.

Most of the mechanical principles used in machinery have their illustrations in animal movements. Some are direct copies from Nature, but others were first contrived by man without his having consciously taken the hint from Nature, and afterwards found to be similarly used in animal mechanics. While this shows that man is created in the image of his Maker, in that the minds of each see truth and the application of principles in the same light, it also shows that man may find it greatly to his advantage to study the mechanism of animals and its applications of force, in order to learn the best means of accomplishing his ends in the mechanic arts. This may be an improvement upon the common method of working out, from the unaided brain, principles which Nature has used and displayed from the earliest time.

The shape and keel of a ship have their best models in in the form and fins of fishes, and in several species of water beetles. It was formerly supposed that it was only necessary to have the bows of a ship sharp and well proportioned; now it is found that the shape of the stern has as much to do with its ease of motion as the shape of the bow, or the way it leaves the water is as important as the way it cuts the water. Hence a boat that is made for speed is now made to taper as gradually toward the stern as toward the stem. This mechanical principle has always been in use in the fish, the water beetle, and the bird. The pectoral and anal fins of fishes answer to the keels of ships, and the tails of both fishes and birds act as rudders. The tail of a fish, in addition, acts as the propelling power, on a principle similar to that of sculling a boat or of screw propellers. Barker's reaction mill, or the force due to unbalanced pressure, is illustrated in the progressive—or rather retrogressive—movement of cuttle fishes, squids, and other cephalopod mollusks. They propel themselves backwards by forcibly ejecting water from an opening near the head.

The toggle joint, which is used in printing presses and in other machinery, has a representative in most of the hinge joints and in some others, of man and inferior animals. The pulley is used in the human body, by the cord which raises the great toe and the foot acting upon ligaments for friction wheels in the ancle; also by the digastric muscle, as it passes through a ring or loop in the muscle which is attached to the hyoid bone, serving the double purpose of raising the larynx in swallowing and of pulling down the lower jaw. The muscle which performs the oblique rolling motion of the eye also works through a loop which serves the purpose of a pulley in changing the direction of motion; as do also those attached to the knee pan.

The three classes of lever are amply illustrated in the various movements of man and other animals. The support and motion of the head upon the upper part of the spinal column illustrates a lever of the first class. The third is shown in raising the forearm by the contraction of a muscle attached a short distance below the elbow. The raising of the body upon the toes has been called a lever of the second class, in which the ball of the foot is the fulcrum, the muscle attached to the tendon of Achilles at the heel is the power, and the weight is applied at the base of the leg. There are some interesting considerations respecting the mechanical principles employed in the last case. If this is a lever of the second class, the question as to how much power is required to raise the weight of a man of ordinary size is an interesting one. On this supposition, the long arm is to the short arm as about 3 : 2; and if the power were applied outside of the body it would require 100 lbs. of power to raise 150 lbs. But as the power that raises the body is itself a part of the weight to be raised, when the muscle has contracted with the force of 100 lbs., its reaction presses downwards, upon the foot acting as a lever, with the force of 100 lbs. This reaction also has to be overcome, which adds so much to the weight of the body to be raised; and when additional force is applied to overcome the added weight, the reaction of this would necessitate still greater force, which would again increase the weight, and so on in an indefinitely decreasing series. If the reaction occurred at the end of the lever where the power is applied, of course the two would exactly balance each other, and all upward motion would be impossible. It would be like a man's trying to lift himself over the fence by his boot straps. But as this reaction occurs one third of the distance to the fulcrum, two thirds of its force at the lever's end would counterbalance it. The result seems to be possible by demonstration of the algebraic equation based on the law of the lever: that the power × the long arm = the weight × the short arm. Then x (the power) $\times 3 = (150 + \frac{2}{3}x) \times 2$; which gives 180 lbs. as the amount of power required to raise 150 lbs. and overcome the reaction of the force exerted. While in theory this seems reasonable enough, in practice the result is widely different. The principle here involved appears the same as when a man stands upon a stiff board one third of the distance from the end of the lever towards the fulcrum, placed at the opposite end, and tries to lift himself by lifting up at the lever's end. And this is practically impossible, whether the power be applied as here stated, or by means of lever and pulley arrangements, so that the power and resistance may act vertically.

The difficulties are not diminished if we consider the movements at this point as illustrations of a lever of the first class. In this case we would call the attachment of the bones of the leg to the bones of the foot the fulcrum, the power at the Achilles tendon as before, and the weight at the point where the ball of the footrests on the ground. On this supposition the force of muscular contraction would tend to press down the earth; but as this is practically immovable, the result is the pushing up of the body, which is is the object most easily moved. We have a similar illustration of this application of the lever in the rowing of a boat. This would require the application of force at a greater disadvantage than in the former case, and consequently a greater strain upon the muscles performing the work. But we know that raising the body on the toes is not accompanied by any painful physical exertion by the individual, and a closer study of the anatomy of the foot shows that the work is not done by one set of muscles alone. The tendons which bend the toes downwards are, after uniting into one, made to pass by a pulley arrangement among the carpal bones, and are attached to a muscle in the calf of the leg. These tendons, being united to the end of the long arm of the lever, enable this muscle to work at an advantage, or, in other words, so that power is gained at the expense of time. But it is probable that the mechanism is even more complicated than this.

The working of the muscles employed in this movement can be illustrated and their force measured by lying on one's back and placing one foot in the loop of a rope which passes over a pulley and has a weight suspended from the other end. As the foot, acting as a lever, is made to move, it will will pull the rope and raise the weight, which may be increased till the limit of muscular power has been reached. In this experiment care must be taken that no other muscles are allowed to aid in the process.

The sliding seat in rowing is one that moves forward as the hand end of the oar is advanced, causing the knees to bend or spread. This gives a longer stroke and double purchase upon the water; for not only the muscles of the arms and trunk are brought into use, but also those of the legs. This new and ingenious contrivance of mechanics, reached without the aid of Nature's suggestions, has been in use before our very eyes from the beginning of man's existence; and we needed but to study and apply the principles of animal mechanism to have employed it in practical life long ago. W. W. Wagstaffe showed, in *Nature*, a few months ago, that the shoulder illustrates the principle of the sliding seat. Besides the very free motion of the ball-and-socket joint at the shoulder, there is a forward and backward movement of six or seven inches, due to rotary motion of the clavicle upon the sternum, and also an up and down movement of about four inches, articulating at the same point, as seen in bell ringing and weight lifting. This gives an additional purchase and advantage, similar to that gained by the sliding seat. S. H. T.

[For the Scientific American.]

TURNING HARD STEEL WITH THE AID OF PETROLEUM AS A LUBRICANT.

BY JOSHUA ROSE.

Some experiments recently made have given the following determinations:

1. That the use of either petroleum or a mixture of the same with spirits of turpentine as a lubricant for turning tools does not enable the tools to cut metal of any greater degree of hardness than can be cut by the same tool when used dry.

2. That the use of the above-named lubricant does not enable a turning tool to cut metal of any degree of hardness or temper at a faster rate of cutting speed than can be attained by the same tool when used dry.

3. That the above-named lubricant is effective, inasmuch as it will keep the cutting edge of the tool comparatively cool, and hence tend to preserve it longer than would otherwise be the case, the practical difference, however, being very slight.

4. That it is impracticable, under any of the ordinary conditions, to properly turn steel of a hardness or degree of temper greater than a deep purple bordering upon a blue.

Below will be found the details of experiments which were conducted by me at the Freeland tool works, at 360 West 34th street, New York city.

A piece of steel ¾ inches diameter and 6 inches long was made red hot and plunged endwise into clean cold water, and held submerged until quite cold. Upon inspection after immersion, the steel was found to be white all over, evidencing that the hardening was performed equally at all parts. One end of the steel was then made red hot and allowed to soften, the temper being permitted to run up at will. It was then placed in the lathe and run at a speed of 10 feet per minute. The lathe tool used was an ordinary front tool, made as hard as fire and water would make it.

A cut $\frac{1}{32}$ inch deep was started at the softened end of the steel, the feed being set at 40 revolutions to an inch. The lubricant, pure crude petroleum, was freely applied from the commencement of the cut. The tool was fed along until finally it commenced to jump, making a cracking noise, due to the excessive pressure with which the tool was forced to its cut. As soon as the cracking began, the tool became dulled and useless; and upon testing the tool with a smooth file, it was found that the file would cut the steel, where the tool cut ceased, the color of the metal being a deep brown. The tool was reground, and applied to the cut where it had left off at the first trial; but it refused to take the cut up any further. It was therefore reground and applied without any lubricant whatever, the cutting speed and feed remaining the same. It took a cut of $\frac{1}{32}$ inch in depth up to the same distance as on the first trial, leaving the cut much smoother, however, than the first one. From the fact that a file would cut the steel where it showed a temper of a brown bordering upon a yellow, it was evident that the sample of steel under operation was not of the best quality; and it was determined to make a second trial, for which a piece of Turton's hammered round tap steel was selected, its diameter being ¾ inch, and its length 6 inches. It was first hardened as hard as fire and water would make it, and then tempered so that the end was purple, the color running up an inch before the deep straw color was reached. The cutting speed was about 7 feet per minute. The tool was ground and applied to the steel where the color was a deep brown bordering on a purple. Crude petroleum was first applied, and by the application of considerable force the tool took a cut about $\frac{1}{32}$ inch deep, carrying it along about ¼ inch where the steel was of a deep brown color. The corner of a smooth file was applied to the cut where it left off, and it would just cut it under severe pressure. The tool was then reground and tried under application of two parts petroleum to one of spirits of turpentine, and then of equal parts of turpentine and petroleum; but the cut could not be carried along any further. The next operation was to try the same tool upon the same steel, but without any lubricant, and the result was that it took a cut $\frac{1}{32}$ inch deep, commencing and leaving off its cut at the same place, but requiring a trifle more power to force it to its cut.

The results so far obtained were not sufficiently encouraging to warrant any minute experiments, because the small diameter and slow rate of cutting speed were the most favorable of conditions; while the rapid destruction of the cutting capabilities of the tool was such that no practically useful effects had so far been obtained. Furthermore, the cutting, performed upon any part of the steel whose temper was greater than a blue, was neither even or smooth; and it was a certainty that no finishing tool could be made to stand, whatever the lubricant employed.

The next operation was to make a test upon a piece of steel tempered to a deep purple for about an inch along its length, the object being to ascertain if, by the use of petroleum or a mixture of petroleum and spirits of turpentine, steel of that degree of temper could be turned at any faster speed than with a tool used dry. The result of the experiment was that the difference, if any, was too slight to be of practical importance. A similar experiment upon a piece of soft steel demonstrated that, by the use of petroleum, no advantage in cutting speed was to be obtained. The cutting speed employed during this experiment was 37 feet per minute.

The last experiment made was upon a piece of Turton's round hammered tap steel, tempered to a clear bright blue along 4 inches of its length, the cutting speed employed being 10 feet per minute. The first cut, $\frac{1}{32}$ inch deep, was taken with a lubricant of three parts petroleum and one part spirits of turpentine, the second cut being taken dry, the result being that the tool stood a little better with the lubricant than without. It has been known for a long time that benzine, kerosene, turpentine, or any of the light volatile oils act as lubricants for cutting tools more effectively than either water or oil, their advantages being that they are more penetrating, and hence approach much more easily and freely to the cutting edge of the tool, which they therefore keep more cool. The difference in their favor is, however, not very great. A short time since, Thomas and Co., of the Freeland Tool Works, had to plane a platen for a printing press, 6 feet by 4 feet, and it was found, after one half had had a cut taken off it, that the other half was chilled so that ordinary tool steel would not touch it. Then Hobson's and Jessop's double refined steels were tried, and it was determined to throw the platen away and cast another. Finally, however, a tool made of chrome steel, $\frac{3}{4}$ by $1\frac{1}{4}$, was used, and it carried the cut across the chilled part nicely. During the last part of the cut, Mr. Thomas took a piece of rag soaked with kerosene and applied it to the tool during the back stroke of the planer, with the result that the tool retained its keenness much longer, thus agreeing with our own experiments, the cutting speed employed being in this case 14 feet per minute.

HARMONY AND DISCORD WITH OPTICAL STUDIES.

LECTURE DELIVERED AT THE STEVENS INSTITUTE OF TECHNOLOGY, BY PROFESSOR C. F. BRACKETT, OF PRINCETON, N. J.

In the previous lecture it was shown that all matter is endued with energy. Hydrogen will penetrate through a porous cell; a ball suspended by a string will continue to vibrate for a long time when set in motion. The vibrations of rods and strings were illustrated in a variety of ways. The cessation of sound in a vacuum was shown by means of a bell under a receiver, and the conduction of sound through wood by muffling a music box and connecting it with an æolian harp by means of a wooden rod.

On the present occasion, we shall consider how the vibrations thus studied may be utilized in that most glorious of all arts, music. If the same note is sounded on a flute, a violin, and an accordeon, we instantly recognize to which instrument it belongs. By the same power the ear recognizes in an adjoining room the voice of a friend who has returned after a long absence, although we have not yet seen his face. The impression thus conveyed is often so precise that we would be willing to swear to his identity in a court. We see thus that tones differ, not only in loudness and pitch, but also in quality or character. The pitch of a sound by which it sounds high or low, acute or grave, is determined by the number of vibrations in a second which the sounding body makes. The loudness may be illustrated by means of a rod secured at one end; if we pull it back only a little and cause its end to describe a small arc, it will not move with as much force as if we bend it back considerably and let it fly with great velocity. The quality of sounds is due to the manner of vibrating. Instead of fastening the rod at one end only, it might be fastened at both, and then the manner of vibrating would be different. In a stretched string there are present a great many different vibrations, all of which combine to give us the impression of a musical note. When we look upon the restless ocean, we perceive at the same time huge billows surmounted by lesser waves, and perhaps delicate ripplets crowning the whole; in like manner musical notes are made up of waves of various sizes.

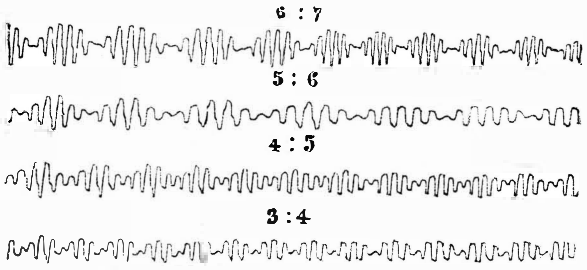
An organ pipe consists essentially of a fine edge placed in a hole; when the air passes over this edge a whistling sound like that of the wind is produced; but when a tube is placed over it, this whistling is raised to the dignity of a musical note by the vibration of the column of air contained in the tube. The same effect is produced by substituting a resonator of proper size for the tube; a sounding box developed a mere hint or ghost of the same sound. After having dissected an organ pipe in this way, another pipe already adjusted was taken, and it was shown that a second, higher sound could be produced in it by harder blowing.

A tuning fork may be set in vibration with a bow in such a manner as to emit no distinctly audible musical tone; when, however, it is held before the mouth, which is opened as though the experimenter were about to sing the corresponding note, the air in the mouth is set in vibration, and the note of the tuning fork is plainly heard. The octave of this note can be obtained in the same way. An organ tube, a resonator, or a sounding box, brought near the tuning fork, will answer the same purpose; but they must be tuned to correspond to the fork, or, in other words, they must contain the proper volume of air. Of a number of resonators on the lecture table, only one responded to the tuning fork used.

If we close the upper end of an organ pipe, a much graver note is produced. The mode of vibration of the air has been changed. When the sound wave strikes the end of the tube, it developes a nodal point, because it is not free to move further in the same direction, but is reflected back to meet the next following wave at other points. Wherever the crests of two waves or the troughs of two waves coincide, larger waves result; but where troughs and crests meet, they neutralize each other and produce nodal points. The modes of vibration are characterized by the position of these nodal points. With the same tube, for example, harder blowing will change the number and the position of the nodal points. What we are accustomed to call the pure, sweet, simple tone of the organ is really nothing of the sort; it is, in fact, a very complex form of vibration. To get a pure and simple note, we must take a tuning fork; hence, by analyzing the compound note of a musical instrument, we ought to be able to recompose it, by combining a number of tuning forks representing its components. To illustrate this, the lecturer imitated a violoncello note by means of a series of tuning forks.

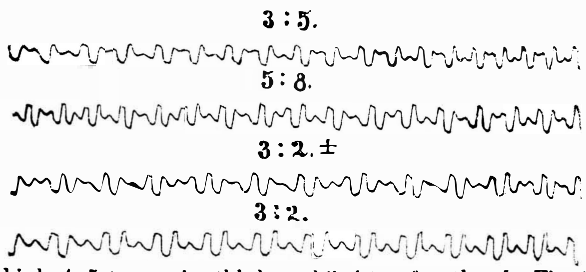
The difficulty in this experiment lies in obtaining the proper relative intensities of the components.

Fig. 1.



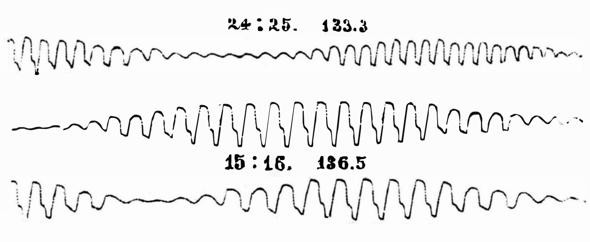
We are not by any means dependent on the ear alone for the study of musical vibrations. They can be made apparent to the eye. If we attach a strip of paper or glass, covered with lampblack or any other fine powder, to one tuning fork and a bristle to another, we will obtain a series of compound curves by drawing the latter slowly over the blackened surface. This curve is a resultant of the two vibrations. In this way very instructive diagrams are produced with tuning forks whose vibrations have certain definite relations, such as those, for example, corresponding to the ordinary musical intervals. In Fig. 1, the ratio of 5 : 6 corresponds to a minor

Fig. 2.



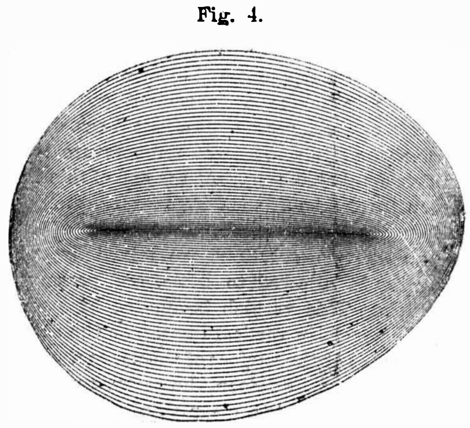
third; 4 : 5 to a major third; and 3 : 4 to a fourth. In Fig. 2 the ratio of 3 : 5 is that of a sixth; 5 : 8 of a minor sixth; and 3 : 2 of a fifth. Fig. 3 exhibits the result of operating with two forks whose vibrations differ more slightly in number. It represents the beating thus produced, with its alternations of intensity.

Fig. 3.



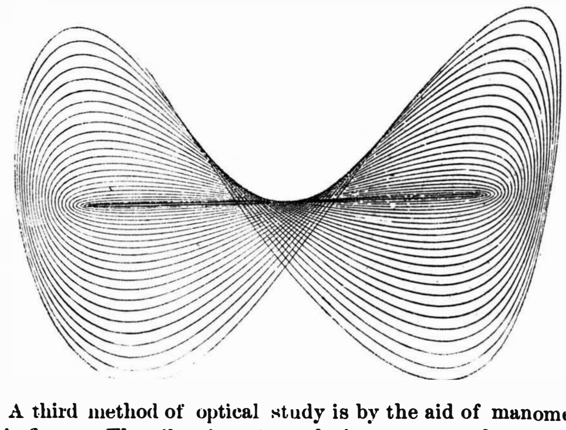
Another way of studying these resultant vibrations is by the aid of Tisley's pendulum, which consists of a marking point so arranged as to obey the motion of two pendulums swinging at right angles to each other. A variety of effects is produced by lengthening and shortening the pendulums and by varying the intensities of their motion. The result is a series of beautiful symmetrical curves represented in the accompanying engravings. Fig. 4 represents unison,

Fig. 4.



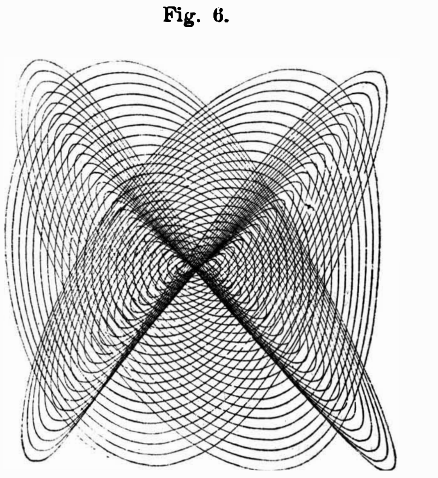
where the vibrating pendulums are of equal length. Fig. 5 represents the octave, where one pendulum is twice the length of the other. Fig. 6 is the fourth, the ratio being three to four; and Fig. 7 is the fifth, having the ratio of 2 to 3. It is almost, if not quite, impossible to produce two figures exactly alike with the same arrangement of the pendulums; they will differ as much as the leaves of the same tree. Although the eye readily detects the difference between them, the sounds they represent are identical to the ear.

Fig. 5.



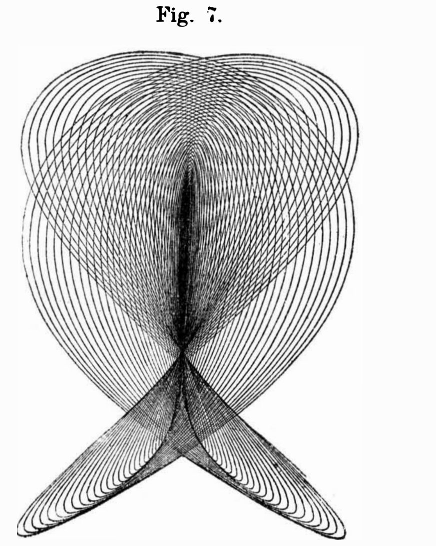
A third method of optical study is by the aid of manometric flames. The vibrations from the instrument to be studied are made to act on a piece of membrane in contact with a stream of illuminating gas feeding a jet. When the gas is

Fig. 6.



lighted and the instrument sounded, the tremors of the membrane cause the flame to vibrate up and down. On revolving a mirror before the flame, the motions of the latter are spread out in the form of serrations differing with the tone. By having a number of such flames and membranes in connection with a series of resonators, composite sounds may be analyzed into their constituents.

Fig. 7.



By means of these and various other apparatus too numerous to describe, even a deaf person could thoroughly study musical vibrations. They enable us to hear, as it were, with our eyes. C. F. K

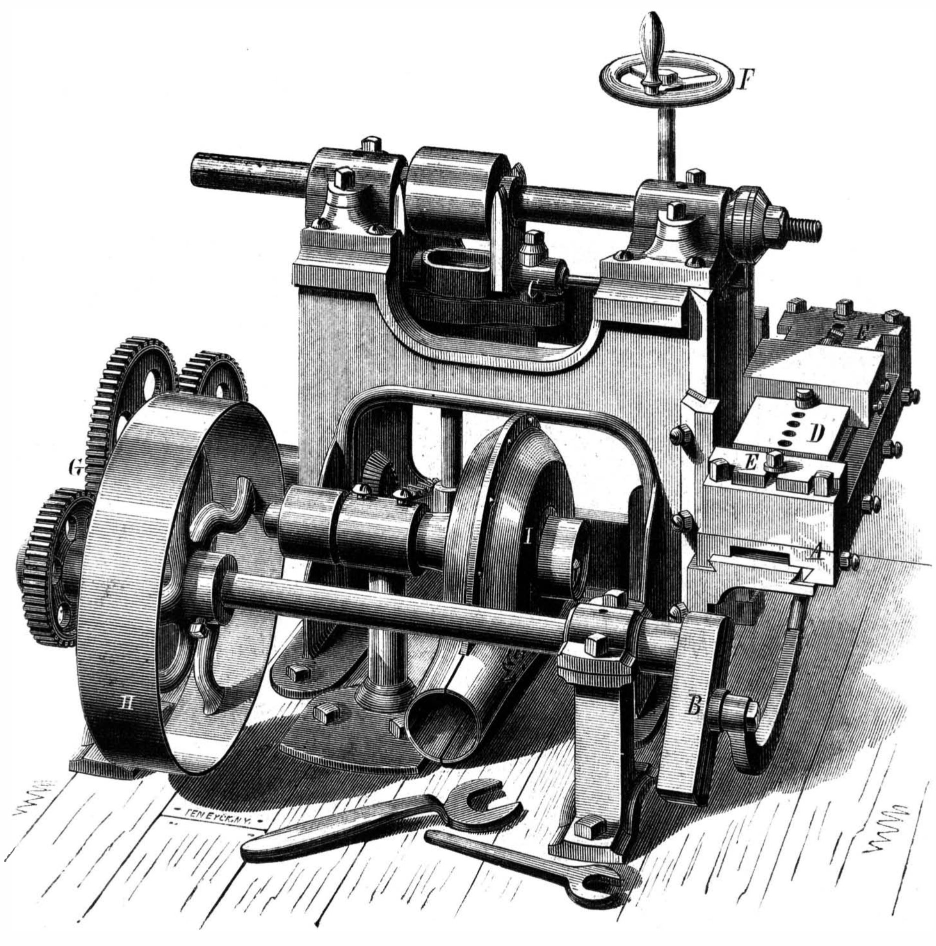
Electricity as a Transmitter of Power.

It is well known that the Gramme magneto-electric machine, which transforms mechanical force into electricity, can also be employed in inverse manner to transform electricity into mechanical force. The property may be utilized to transmit power over long distances. The motor of a factory, for example, could be connected with one machine so as to rotate the same and thus generate a current. This current, carried over distances by cables, might be communicated to another Gramme machine at the point where the power is required. The second machine, by the current, would thus be caused to revolve, and the power would be utilized as necessary.

Of course, in this double operation, there is a loss; but according to M. Magnon, who has investigated the subject experimentally, this is even less than takes place with any other mechanical disposition. If the waste of power equaled that involved in transmission by wire rope, long belts, and like means, it appears that the new plan has superior advantages, in that it does away with a large amount of shafting, belting, etc., and besides allows of power being transmitted over much longer distances than would be practicable by such devices. The details of M. Magnon's experiments, are not given, so that we are unable to review the data on which his opinion is based.

IMPROVED PONY PLANER.

In our issue of October 31, 1874, we published an engraving of a novel machine in which an emery wheel was used for the first time for surfacing files and sadirons, finishing anvils, nuts, gibs, keys, slide valves, straps, crossheads, and, in short, for accomplishing the majority of work usually surfaced on the planer, milling machine, and shaper. The mode of operation consisted in adjusting the object to be surfaced in the chuck to proper elevation, when it was carried under the wheel, and at the same time the latter was drawn across it. This motion continued until the table carried the work out of the action of the grinder. Then, by means of suitable mechanism, the operator slightly elevated the object and caused it to run back again under the wheel. Of this machine the invention herewith illustrated is a modification. The main difference is that the planer bed, A, is made to slide to and fro on its ways by the action of the crank, B, the work being thus moved to and fro in the line of the emery wheel's revolution, while the wheel also has a cross motion imparted to it by the crank, C. This new motion of the table corrects the inaccuracy resulting from gradual decrease in the wheel's diameter, there being a perceptible wear in the wheel, so that it grinds a long flat piece taper instead of plane, when the work slowly passes under it; while, by this crank throw, the whole length of work is brought in contact with the wheel at each throw. The chuck, D, rests on four springs, and rises and falls vertically in planed ways. E E are adjustable stops. When these stops have been adjusted, and the wheel no longer cuts, the work must be plane. The springs force the (chuck) work against the wheel, and yet act as safety appliances against overfriction and pressure. The whole table and bed has a vertical adjustment by the screw, F. Three belts are needed: one to the wheel mandrels, one to the suction fan, and one to the driver. The gears, G, being interchangeable, allow the proportion of speeds between the wheel shafts and the table to be altered in various ways.



NEWMAN'S PONY PLANER.

The machine stands 32 inches high, and is 2 feet 8 inches each way. It will grind work 9 inches long by 5 inches wide. It is adapted to all small flat work, especially to dies of hardened steel and chilled iron, to parts of gun and pistol locks, sewing machine work, small levels, machine keys, locks, etc. Lastly, it is claimed that thousands of small parts can, by this means, be finished to a gage with greater exactness than can be done in any other way. The remaining portions of the device are similar to those in the device first alluded to above. H is the driving pulley, and I is a small suction blower used to draw away the dust from the machine.

For further information, address the Tanite Company, Stroudsburg, Pa.

UMBRELLA SUPPORTER.

Mrs. Eliza M. Arnold, of Houston, Texas, has invented a new parasol and umbrella supporter, of which we give a perspective view, illustrating its use.

A A are two rods, curved to fit upon the forward side of and pass over the shoulders of the wearer. The lower ends of the rods, A A, are attached or hinged, as shown at a^1, to an open metallic ring, B, of such a length as to pass around, or nearly around, the waist of the wearer, to be secured to a belt, E, buckled or clasped around the waist. The upper parts of the rods, A A, curve toward each other, have a coil formed in them to give them elasticity, and are bent upward; they are connected with or are coiled to form a socket to receive the handle of the parasol or umbrella. To the rods, A A, are attached straps, C C, to be passed around the arms or across the breast of the wearer, to keep the said rods in place. D D are elastic straps, which are attached to the frame of the parasol or umbrella, the free ends of which are provided with loops or rings to catch upon buttons, a^2, attached to the belt, E, so that by adjusting the straps, D, the parasol or umbrella may be tilted or inclined forward or backward, or to either side, as circumstances may require. The device may be worn with the rods, A A, passing down in front of the shoulders, or in the rear of the shoulders, or one in front and the other in the rear of either shoulder, as desired.

A New Phase in Gold Mining.

Since the discovery of gold in talco-slate a few months ago, and the active development of a mine of that description in El Dorado county, by the Old Hickory Gold Mining Company, a great interest in that peculiar formation has been displayed by our miners, and we will therefore give a short description of the material and its constituents.

Talco-slate, or the slaty formation of steatite, is of primary period, and is generally found in large ledges and deposits in the slate range. It is ordinarily called soapstone, and consists of silica 62·6, magnesia 32·5, water 4·9. It is perfectly fireproof, and of the same class as asbestos; and considering that its hardness is only two, to seven of quartz, we dare say that the stamping or rather grinding of it can be done very easily. The company now developing the first mine of that description on this coast have 22 feet of a ledge, the assays of which run from $50 to $200 per tun; and we are credibly informed that the ore, on account of its softness, will work by pan amalgamation with alkalines for $2.00 per tun. The sulphurets contained in the ore assay $329 per tun, and constitute about five per cent As the ledge is traceable for miles, we may shortly look for interesting developments in that quarter.—*Mining and Scientific Press.*

Elastic Dammar Varnish for Photographs, etc.

An elastic flexible varnish for paper, which may be applied without previously sizing the article, may be prepared as follows: Crush transparent and clear pieces of dammar into small grains; introduce a convenient quantity—say forty grains—into a flask, pour on it about 6 ozs. of acetone, and expose the whole to a moderate temperature for about two weeks, frequently shaking. At the end of this time, pour off the clear saturated solution of dammar in acetone, and add, to every four parts of varnish, three parts of rather dense collodion; the two solutions are mixed by agitation, the resulting liquid allowed to settle, and preserved in well closed phials. This varnish is applied by means of a soft beaver hair pencil, in vertical lines. At the first application it will appear as if the surface of the paper were covered with a thin white skin. As soon, however, as the varnish has become dry, it presents a clear shining surface. It should be applied in two or three layers.

This varnish retains its gloss under all conditions of weather, and remains elastic; the latter quality adapts it especially to topographical crayon drawings and maps, as well as to photographs.—*Pharmazeutisches Centralhalle.*

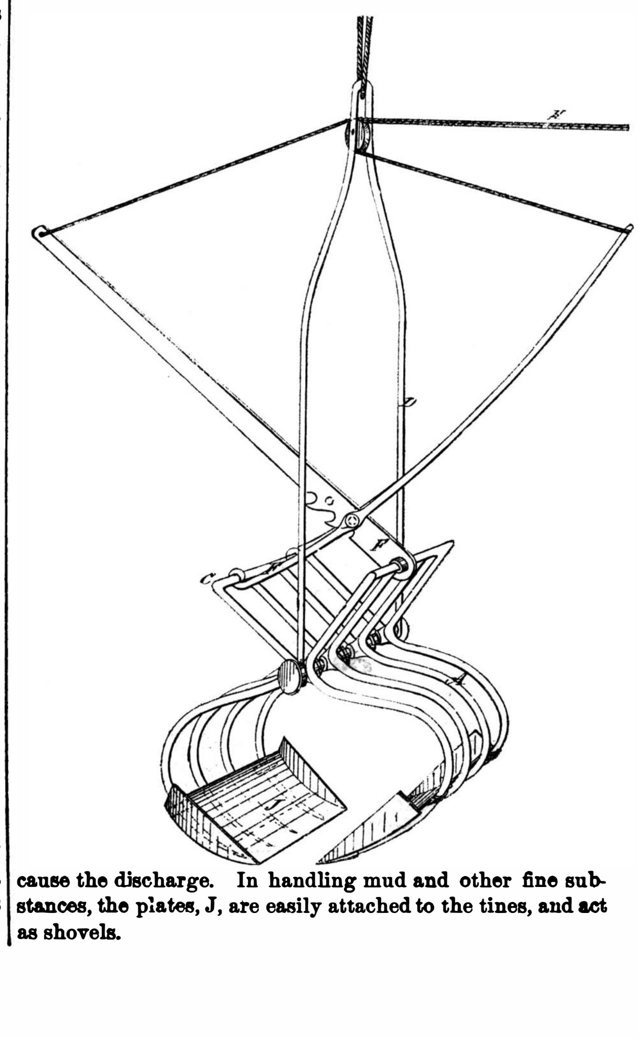
Photo Portraits with Borders.

M. C. Quesnay, of Lille, France, gives the following for producing in one printing a portrait combined with a border in any design, and in the same or two different tints. In taking the portrait, the glass is first cleaned and treated with an ethereal solution of wax; it is then collodionized, sensitized, and exposed in the usual manner. Upon the ground glass of the camera an oval is traced of the exact size the portrait is required, and between the prepared plate and the shutter of the dark slide is fixed a mask, cut to the exact size of the oval upon the focussing glass. By this means the photograph is produced with a transparent border. After washing the negative, flow over it a fifteen grain solution of gelatin to the depth of about one twentieth of an inch, and set it aside to dry in a place free from dust. When quite dry, it is coated with ordinary transfer collodion, and strips of paper are gummed upon the borders; when the latter have become dry, the pellicular negative is detached from the glass by cutting round the edges with a sharp penknife. A second negative is then produced of the object or surface intended to be used as the ground for the border, a mask being employed in such a manner as to leave a transparent opening in the center, the exact size of the portrait previously produced; the two negatives are then superimposed and printed from in the ordinary manner. If the back ground or border be required in a different tint, the print, upon removal from the frame, must be washed thoroughly to remove free silver. With a brush dipped in solution of hyposulphite of soda, go carefully over the portion representing the border, and again wash thoroughly. After toning, the portrait will have the usual purple or violet brown tone, while the border will be represented by a sepia tint. This plan may be modified by cutting out the portrait from the pellicular negative, and gumming it, together with an open mask representing the pattern of the border, upon a piece of glass or mica, and proceeding as in the former case.

CHAFFIN'S IMPROVED HAY FORK.

Mr. David S. Chaffin, of Vinton, Iowa, has patented through the Scientific American Patent Agency (April 25, 1876) the new grappling fork represented in the annexed engraving. The apparatus is adapted for handling hay, manure, and like materials by horse power. It also may be employed for removing stones, etc., from the bottoms of shallow ponds, and will find various other convenient utilizations about a farm.

The curved tines, A, are pivoted to each other, and upon their upper ends are formed rigid bails. To the ends of the pivot bolt is pivoted a clevis, D, to which the hoisting rope is attached, as shown. To the bails of the arms are connected the pivoted levers, F, the lower end of one of which is slotted to admit of the passage through of the other. The inner lever has several notches formed in it to receive the pivot bolt, so that the fork may be locked with the points of the tines close together or at any distance apart. The levers, F, are governed by ropes, H. By this construction, the weight of the fork and load is entirely supported by the clevis, D, so that the levers may be easily operated by the trip rope to



cause the discharge. In handling mud and other fine substances, the plates, J, are easily attached to the tines, and act as shovels.

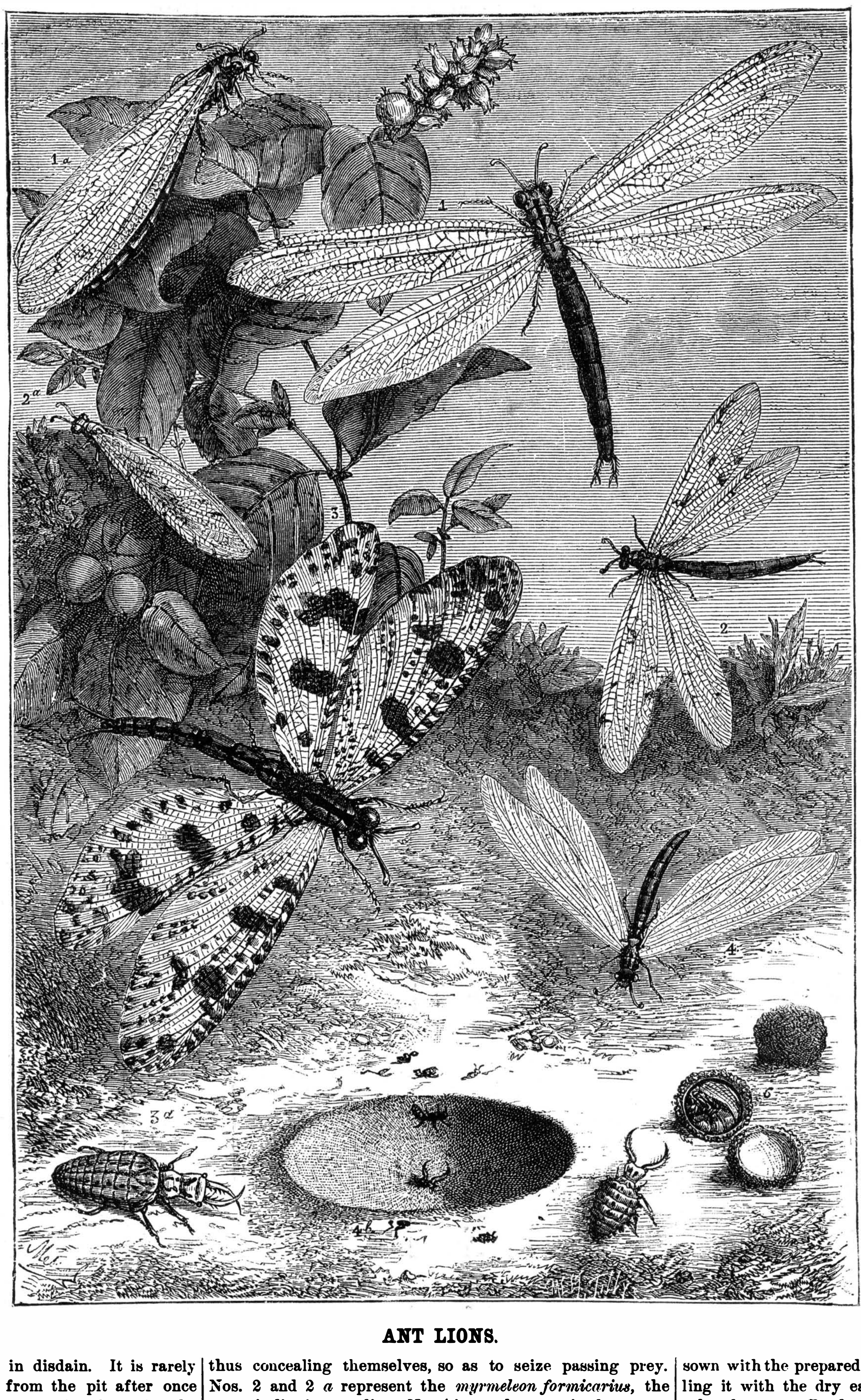
VARIOUS SPECIES OF ANT LIONS.

The *neuroptera* are an order of insects known by the possession of four equal-sized membranous wings, divided into a great number of little cells, technically called areolets. The mouth is furnished with transversely movable jaws, and the females do not possess a strong or a valved ovipositor. In this order are comprised the dragon flies, May flies, termites, lace wings, and lastly, the very curious insects which form the subject of our engraving herewith given, the ant lion. The interesting period of the life of these creatures occurs during their larval state. They then appear as represented at 4 *a* in the illustration. The shape is ovoid, color a reddish gray, and the body is covered with down. They resemble flattened maggots with rather long legs and very large jaws, the legs being apparently useless as organs of progression, all movements being made by the abdomen. It is on account of this inability to pursue and capture its prey, which is wholly composed of living insects, that Nature has provided the insect with instinct to resort to strategic means to bring its victim within its clutches.

It is common to find in sandy fields of the old world small cavities, varying in diameter from one tenth of an inch to two and a half inches in diameter, and about three quarters deep as wide. These are the pit falls (see engraving at 4*b*) made by the ant lion, and closer examination will show the claws of the insect protruding, as it lies in ambush, buried in the sand. To make these hollows, the creature selects a locality where there is fine sand. It begins operations by bending down the extremity of its body and then pushing or rather dragging itself backwards by the assistance of its hind legs, but more particularly by the aid of the deflexed extremity of its body; it gradually insinuates itself into and beneath the sand, constantly throwing off the particles which falls upon it or which it shovels with its jaws or legs upon its head, by suddenly jerking them to the rear. It works in a spiral, commencing at the outer circumference of its cavity and gradually diminishing the diameter of its path until the conical pit is formed. Should a pebble be encountered the insect insinuates its head beneath it and labors until it gets the obstacle fairly balanced on its back. Then it attempts to climb up the slope it has hollowed with its load, often unsuccessfully, for the stone easily loses equilibrium and rolls down to the bottom. But the ant lion is obstinately pertinacious and a marvel of patience besides, so that the effort is repeated again and again until the stone is finally thrown clear of the pit. Its trap constructed to its liking, the larva buries itself as already stated, spreads its jaws, and waits. Any insect, whether caterpillar, ant, spider, or fly, serves as food, so long as it is living and active. Dead insects the ant lion rejects and tosses out of its hole in disdain. It is rarely that any crawling insect escapes from the pit after once entering it; its efforts to climb out are fruitless, for the particles of sand roll beneath its feet, and it gradually slides down to the bottom and into the jaws of the watcher. Should the victim, however, attempt to stop its downward progress by thrusting its claws into the sand, the ant lion converts its head into a catapult and throws up sand, which deepens its hole and renders the side steeper, and also covers the unfortunate insect with a shower of particles by which it is compelled to let go its hold. The instant the ant lion grasps its prey, its ferocity redoubles. Neither wasp nor bee can offer any successful resistance, for their captor dashes its prey again and again to the ground, and shakes it in its terrible pincers until it becomes stupefied and motionless. Then the larva quietly devours it.

Previous to assuming the pupa state, the larva forms a globular cocoon (5 and 6 in the engraving) of less than half an inch in diameter, of fine sand, glued with silken thread spun from a slender telescopic spinneret, placed at the extremity of the body. The pupa is small and lies with its limbs folded upon its breast. When ready to assume the perfect state, it uses its mandibles, which are quite unlike those of the larva, to gnaw a hole through the cocoon, and pushes itself partly through the aperture in which it leaves its pupa skin. The abdomen then extends to nearly three times its previous length; and the perfect insect closely resembles the dragon fly, save that the wings are lighter, softer, and broader.

Various species of the perfect ant lion are represented in the engraving, for which we are indebted to *La Nature*. Nos. 1 and 1*a* is the *acanthlacisis occitanica*, during flight and in repose. It is of a reddish brown color, marked with black lines. Its larva, larger than those of the ordinary species of ant lion, are also lighter in color; and instead of digging a pit they back into the sand for a short distance, thus concealing themselves, so as to seize passing prey. Nos. 2 and 2 *a* represent the *myrmeleon formicarius*, the true pit-digging ant lion. No. 4 is another species known as *myrmeleon formicalynx*. No. 3 is the *palpares libelluloides*, the larva of which takes its prey in the same manner as that of the *acanthaclisis*.



ANT LIONS.

An Agricultural Application of Paraffin Oil.

A correspondent of the *Dunfermline Journal* tells us that he has tried a number of experiments, extending over a course of years, which satisfy him that paraffin oil is something more than a substitute for the best guano. His garden having been overrun with rats and mice, he had to sow double quantity of peas and beans, and sometimes to sow these twice over. Last year he sowed 22 lbs. of beans and 6 lbs. of peas without any manure, but he previously soaked the seeds for a short time in paraffin oil. None were touched; every pea and bean germinated, and the crop was enormous. Formerly his onions were annually attacked by maggots, and his turnips by flies; but during the last eight years he watered between the rows with a mixture of 2 ozs. of paraffin oil with 6 gallons of water. Both maggots and flies immediately disappeared, and the crop became exceeding large and fine. He recommends that seeds of all kinds should be sprinkled with the oil before sowing, or that a certain portion of paraffin oil should be poured over dry earth or sand, and this prepared earth should be sown as guano. He believes that such earth is a powerful manure as well as a remedy for wire worm, grub, and all garden, field, and vinery pests. He states that grain sprinkled with the oil is quite safe from all birds as well as insect vermin. For watering green vegetables, he recommends a mixture of 2 wineglassfuls of paraffin oil and 6 gallons of rainwater, and states that this will do no injury to the plants, but that the growth succeeding its application is something wonderful, and that onions and carrots should be watered with this when one inch long. Being a Scotchman, he concludes by adding that a glassful of whisky added to the oil makes it more agreeable to the water, and enables it to mix more readily.

We have not yet had an opportunity of repeating these experiments, but hope to do so, and in the meantime recommend them to the consideration those of our readers who are doing business in agricultural districts. When farmers come to seek shopkeepers for their customary supplies of oil, candles, etc., these experiments may be mentioned, and the farmer induced to repeat them. No harm would be done even if they fail, as the seed would not be injured. If they succeed only partially, both shopkeeper and farmer will gain—one by saving his seed, the other by finding customers for respectable quantities of paraffin oil, as such an application as this, on a practical scale, will demand large supplies. We fear, however, that on one point the correspondent of our contemporary has been more or less (probably more) self-deluded. We allude to the great manurial value of paraffin oil. Now we know that paraffin oil is simply a hydrocarbon, and that mere carbon and hydrogen are not the elements which are thus demanded. Therefore we must renounce all that the elaborate and careful investigations of Liebig and his able compeers and successors have taught us, in order to accept the conclusions of the Dunfermline experimenter.

The other use of paraffin oil, namely, that of protecting seed and young plants from birds and vermin, is quite free from any such theoretical objection. On the contrary, it recommends itself, as the hydrocarbons are more or less potent in repelling vermin. Paraffin oil is chemically inert, and will not damage the seed; but if its flavor or the odor of its vapor is sufficiently decided to drive away the creatures that do such serious damage, it will be a farmer's friend indeed, and will thereby be sufficiently recommended without pretending to any miraculous manurial value. To test it fairly, a portion of a field should be sown with the prepared seed, and further fortified by sprinkling it with the dry earth or sand which—to coin a term—has been paraffined, while the other half of the same field is planted in the usual way, both halves having been equally dressed with ordinary manure. If the paraffin repels the vermin, the unprotected half will probably be rather worse than usual, as it would become an asylum for the refugees, and thus the contrast between the two halves would be instructively hightened.—*The London Grocer.*

Rhubarb.

Lieutenant Colonel Prejevalsky, the Russian traveler who recently performed a journey into the interior of Mongolia, refers to the medicinal rhubarb grown in that province, whence it finds its way all over the world. He gives a full description of the plant, the soil in which it grows, the time and manner of gathering it, and the trade itself in rhubarb. It costs on the spot 2 or 3 cents per lb., and in the town of Si-ning, the chief market for rhubarb, 12 cents per lb. It is the opinion of Colonel Prejevalsky that there would be no difficulty in cultivating and acclimatizing it in Siberia.

ICE MACHINERY.

As an appropriate subject for the present hot weather, we sele t from Mr. E. H. Knight's "Mechanical Dictionary,"* the annexed engravings and following description of ice machinery. The apparatus illustrated depends upon the vaporization of water, ether, ammonia, benzole, etc., which, in assuming the vaporous form, change sensible heat into latent, extracting it from the reservoir of water, the contents of which are thereby congealed.

The Parisian restaurants have decanters (*carafons frappés*) filled with water frozen by placing them in shallow tanks of sea water, each of which is provided with a copper reservoir connected with a receiver filled with ether. The air is exhausted from the reservoirs by an air pump worked by steam, vaporizing the ether and reducing the temperature of the sea water and that in the decanters below the freezing point. The water in the decanters usually remains liquid until stirred with a glass rod, when it immediately congeals.

Edmond Carré's sulphuric acid freezing apparatus is upon this principle (shown at 1, Fig. 1), and is also used to make the *carafons frappés* so frequently seen in Paris. It consists of a large vessel, resembling the boiler of a steam engine, which is designed to contain the concentrated sulphuric acid; of an air pump with tube connections to be adapted to the wide mouths of the *carafons*, and of a mechanism by which the lever of the air pump is made to keep the acid in continual agitation. The great volume of the acid renders the loss of absorptive power by dilution very slow, and the constant agitation prevents the formation of a superficial dilute stratum, which would interfere materially with the success.

In 1, Fig. 1, *a* is the reservoir of sulphuric acid; *f*, a *carafon* of water connected by the tube, *r*, with the apparatus, and having a stopcock at *l*. *p* is the barrel of the pump, and *h* its lever, which also agitates the oscillator, shown in dotted lines.

Ferdinand Carré's intermittent apparatus, 2, Fig. 1, has a boiler containing the ammonia, connecting by the pipe, *r r*, with the refrigerator, *t*, which has a well in which is a pan containing the water, *z*, to be frozen. The boiler, *k*, is placed over a portable furnace, and the apparatus purged of air, which is driven by the evolved gas out at the stopcock, *m*, This being closed, and the refrigerator immersed in a tank of cool water, the temperature of the aqua ammonia is raised to 230° or 240° Fah., at which heat the ammonia is expelled and is condensed in a liquid form in the refrigerator, *t*. The boiler, *k*, being now removed from the furnace and placed in the water bath, the temperature of the water in the boiler will fall and the power of the water to dissolve ammonia will be restored. The gas will be rapidly re-dissolved, reducing the pressure, as the liquid ammonia will evaporate with corresponding rapidity, drawing for its latent heat upon the sensible heat of the water to be frozen. The result will be the complete evaporation of the liquefied ammonia and the restoration of an aqueous solution, in the boiler, of the original strength. Between the ice pan and the well is a body of alcohol, which will not freeze, but will act as a conductor. During the refrigeration, the vessel, *t*, has a non-conducting envelope.

Ferdinand Carré's continuous process, shown in the three other views in Fig. 1, depends also for its efficacy upon the evaporation of liquid ammonia. *a* is the boiler, exposed to the heat of the furnace, *b*; *c* is an indicator to show the level of the liquid; *i* is a tube conducting gas to the liquefier, *j*; the vertical pipe above the branch, *i*, leads to a safety valve, and any escaping gas passes by pipe, *c*, to the water tank, *e'*, where it is absorbed. *f* is a tube which brings back to the boiler saturated solution of ammonia from the absorbing apparatus, *u u*; this solution passes downward, trickling through the perforated trays, *g*, while the ascending gas rises in a sinuous course alternately around the edge of one tray and through a central hole in the next, and so on. This condenses and carries back the watery vapor which accompanies the gas.

The gas passes by tube, *i*, to the liquefier, *j*, passing through a box, *k*, and a series of zigzag and spiral tubes in a bath of cold water constantly renewed from reservoir, *z*, which also supplies other parts of the apparatus. The tubes terminate in another box, *k'*, and the ammonia is by this time in a liquid state under the pressure of 10 atmospheres, which is constantly maintained in the boiler. In the liquid state the ammonia passes by the pipe, *l*, to the efflux regulator, *m*, which is the dividing barrier between the part of the machine in which a regular pressure of 10 atmospheres is maintained and the following part where the pressure does not exceed 1½ atmospheres. The regulating device is a floating cup which opens or closes a hole of influx.

The liquid passes from the regulator, *m*, by pipe, *n*, to the distributor, *p*, the pipe, *n*, being wound spirally around the tube, *t*, through which the vaporized ammonia is returning from the refrigerator, *q q*, the vapors serving to reduce the temperature of the liquid in *n* before it reaches the refrigerator.

The refrigerator itself consists of a number of zigzag or spiral tubes—in the apparatus here represented, six in all—immersed in a tank constructed of non-conducting substances. Each one of the six zigzags receives an equal supply of the liquid ammonia from the distributor. The small tubes conveying this supply are shown at *p*. The vessels, *r*, to be refrigerated are sustained on a carriage, which is slid back and forth by the same power that works the pump, *g'*, by which the re-saturated solution of ammonia is returned to the boiler. The space in the tank surrounding the zigzags and the water vessels, *r*, is filled with an uncongelable liquid, such as alcohol or a solution of chloride of calcium. The ammonia in the zigzags, *q*, discharges in a vaporized form into the collector, *s*, and passes through the tube, *t*, to the cylinder, *u*, where it extends nearly to the bottom of the vessel, and there discharges the gas into the water which has been brought from the bottom of the boiler, *a*, and partially fills the cylinder, *u*. From this water the ammonia has been nearly exhausted, and it therefore greedily absorbs the gas ejected into it by pipe, *t*. On the left of vessel *u*, is a water level indicator. Within the vessel, *u*, is a worm which receives water by pipe, *a'*, from the elevated reservoir, *z*; after passing to the bottom of the spiral, the pipe curves upward and then (marked *b*) descends nearly to the bottom of the vessel, *y*, where it discharges.

The water from the boiler, *a*, passes by pipes, *w w*, to the coolers, *x y*, before reaching the vessel, *u*, where it re-absorbs ammonia. Between the boiler, *a*, and the vessel, *u*, the water is cooled so as to fit it for absorbing gas more freely. The pressure in the boiler is sufficient to expel it when the stopcock, *w*, is opened. The vessel, *x*, is formed of two concentric cylinders, between which are two spiral tubes formed of the pipe, *w*, continued, and these s pirals are immersed in a liquid which fills the annular space between the cylinders, and is the reconstituted ammoniacal solution on its way from the absorber, *u*, to the boiler, *a*. From *x*, the water in the spiral is conveyed in the pipe, *w*, still continued in a single spiral ascending in the vessel, *y*, and continued further in a pipe, *w*, alongside of the absorber, *u*, into which it discharges into a sieve, *v*, and from which it descends in a shower.

The exhausted solution from the boiler, *a*, flows freely, as has been said, from the boiler, by pipe, *w*, to the absorber, *u*, passing the coolers, *x y*, as described; but it requires some power to force the reconstituted solution back from the absorber, *u*, through the pipe, *f*, to the boiler. This power is a pump, *g'*, driven by a steam engine or other motor, and taking the saturated solution from the absorber by pipe, *h'*, and discharging it by pipe, *i'*, into the vessel, *x*, whence it passes by pipe, *f*, to the dome above the boiler, as described previously. Gas finding its way into the pump is discharged into the upper part of *u*. *e''* is a pipe leading to the enveloping tube, *o*, whence water is conducted by *f'* for the use of ice vessels, *r*. As the water passes through *o* it is cooled by the ascending vapors of ammonia.

In starting the machine, it is first blown through to expel the air. The air escaping from the vessel, *u*, passes by pipe, *c*, to the purger, *d*, and passes beneath the surface of the water therein, which retains any escaping ammonia.

Fig. 2 is an

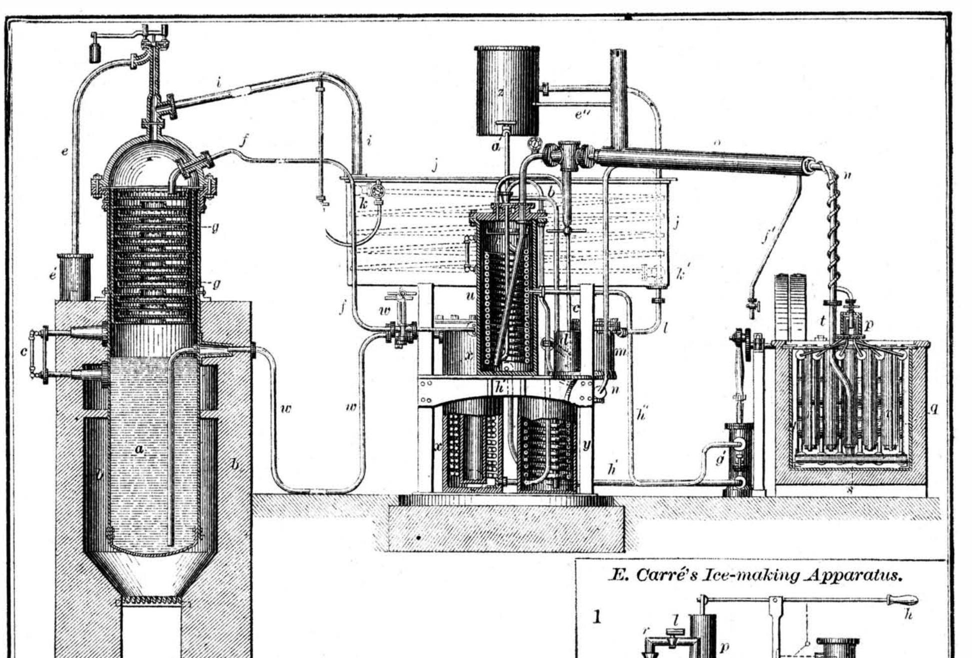
ICE PLANE

for shaving off fragments of ice for cooling drinks. It consists simply of a couple of plane knives inserted in a board, over which the ice is drawn. The shavings fall through the apertures beside the blades and into the vessel placed below for their reception. An interesting device, which we may here add, since it is connected with the subject of ice, is an

ICE LOCOMOTIVE

or traction engine, for running on ice (Fig. 3). It was constructed by the Messrs. Neilson, of Glasgow, Scotland, and employed for carrying passengers and freight between St. Petersburg and Cronstadt, Russia. It has two driving wheels, each 5 feet in diameter and studded with spikes. The front part rests on a sledge, which is swiveled and may be turned by the wheel which has an endless screw, working a pinion that turns a segment rack attached to the sledgebody. The cylinders are 10 inches in diameter and of 22 inches stroke. The weight of the engine is 12 tuns, and it is said to have attained a speed of 18 miles per hour on the ice.

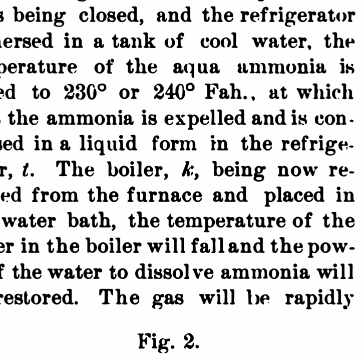
Fig. 1.



E. Carré's Ice-making Apparatus. — Ferdinand Carré's Portable Apparatus. — Ferdinand Carré's "Continuous" Ice-making Apparatus.

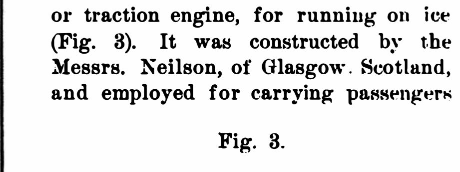
CARRÉ'S ICE-MAKING MACHINES.

Fig. 2.



Ice Planes

Fig. 3.



Ice-Locomotive.

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

Mineral Manures for Potato Blight.

Just now, when chemical fertilizers are creating so much attention, it is of interest to note that Mr. Charles T. Hayward, of England, as we learn from the *Journal of Horticulture*, has apparently succeeded in preventing potato blight, by supplying the mineral elements of potato plant food to his garden, which had previously been well dressed with nitrogenous manures. He claims to have secured a better crop, the tubers more even in size, smooth skinned, and free from disease; while the market gardeners about him suffered heavy losses from the potato disease.

Cellulose.

Dr. Mitscherlich, of Darmstadt, has devised a method of making paper stock (cellulose) from wood by a chemical process, which differs somewhat from those previously in use. The chief peculiarity of this process, which is in use already in Prussia and Saxony, says the Hesse *Gewerbeblatt*, consists in this, that the incrusting substance of the wood is not destroyed, but only separated from the cellulose, and eventually rendered soluble.

In this process, it is not necessary to cut the wood up very fine, as in the Sinclair process, but only to split it up like ordinary firewood for a parlor stove. A chemically prepared solution of lime is boiled for six hours with the wood under a pressure of 3 atmospheres. After the boiling, a portion of the incrusting material is found dissolved in the liquor, and part of it in the pores of the wood, from which it is extracted by a suitable squeezing apparatus.

If it is desired to make a very valuable paper stock, which shall be as white as possible without bleaching, they only employ white wood as free from rosin as possible, like poplar, linden, etc. These kinds of wood are not decolorized any farther in this process, and the albuminoid and gummy substances are mostly dissolved. The success of this process depends less on the pressure during boiling than on the temperature, which must not exceed 248° Fah.

The use of oak wood for paper stock offers one advantage, namely, that the tannin contained in it is obtained as a by-product, and the solution thus obtained can be very profitably employed for tanning, as experiments in this direction have abundantly proved. The solution which runs off from the wood, or expressed from it, in this new process, is already so concentrated that evaporation seems superfluous, and is only undertaken when a very concentrated solution of tannic acid is required either for transportation or for keeping. The other chemicals contained in the lye are in no way a hindrance to thet anning process, but rather aid it. Experiments show that hides prepared in the usual manner, when simply laid in this liquor, were perfectly tanned in ten days.

NEW BOOKS AND PUBLICATIONS.

THE ANDES AND THE AMAZONS, or Across the Continent of South America. By Professor James Orton. Third Edition, revised, and enlarged, with Maps and Illustrations. New York city: Harper & Brothers.

In 1867, Professor Orton set out on his first journey across Equatorial South America, and the record of his travels is embodied in the first edition of the present work. In 1873, he made a second expedition, and navigated the Amazons from Para to Yurimaguas, thence over the Andes to the Pacific coast and down to Lima. The main objects of the journey were scientific, and they included a special study of the Marañon region, of which little has hitherto been known, besides the collection of facts illustrating the commercial resources and possibilities of the Valley of the Amazons. We need hardly say that Professor Orton has accomplished his task thoroughly and well, for our readers are already familiar with portions of his journey through the admirable letters which he forwarded to the SCIENTIFIC AMERICAN from many interesting points along his route. Those who have read these fascinating recitals, and desire to know more of the strange region which they describe, will gladly welcome the present volume, in whose copious pages details, necessarily abbreviated in the newspapers, are presented in full. The illustrations are excellent and lavishly supplied. By them, and together with the two large maps added, the reader cannot fail to realize the journey so lucidly described by the author.

Recent American and Foreign Patents.

NEW WOODWORKING AND HOUSE AND CARRIAGE BUILDING INVENTIONS.

IMPROVED DUMPING CAR.

David Manuel, Readville, assignor to himself and Ezra G. Perkins, Hyde Park, Mass.—This consists of a body supported on rockers, which work on rocker beds mounted on the perch of the car, and having links so connected with the rockers as to allow them to work freely, and at the same time keep them on the rocker bed; and it also consists of a contrivance of the brakes to swing together with the wheels.

IMPROVED STENCH TRAP.

Edward F. Hutchins, Toronto, Canada.—In order to so improve the metallic stench trap in common use that the bursting of the same by freezing is avoided, and that the detaching of the trap for cleaning or melting the ice may be readily accomplished, this inventor proposes a stench trap made of an elastic material, connected in a detachable manner to the pipes.

IMPROVED VELOCIPEDE.

R. Walcot Laurence, New York city.—This invention consists in mounting the steering wheel on the reach of a lever pivoted to the seat and arranged in an axle guide, extended forward to the foot rest. It can be worked by the fect to guide the carriage while the propelling power is applied by hand, and the carriage can also be guided by the driving wheels by turning one faster than the other.

IMPROVED METALLIC ROOFS.

Francis C. Conklin, Monroe, N. Y.—This consists in the combination, with a shingle roof, of strips often extending from peak to eaves, also strips nailed at the butt of each row of shingles, and a wood strip arranged along the margin and edge of the two strips. The latter are similarly connected by hooked flanges.

IMPROVED FLOOR CLAMP.

William S. Spink and Wilber Mason, Providence, R. I.—This consists of a grooved base piece, with floor entering knives, a ratchet slide piece, and an operating lever, together with moving and locking pawls. The operating pawl has a tap pin that releases the locking pawl when the slide piece is to be carried back.

IMPROVED FASTENER FOR THE MEETING RAILS OF SASHES

George Edwards, Brompton Road, South Kensington, England.—This improvement serves to facilitate the disengagement of the devices previous to moving the sashes. It is also provided with means for drawing together the adjacent edges of the two sashes, to prevent rattling and exclude drafts. It is a simple and ingenious spring bolt, having a screw attachment whereby the sashes may be drawn together.

IMPROVED PLASTERING LATH.

Theophilus A. Scheller, Marysville, Cal.—This is an improved plastering lath, by which the plastering is firmly held without danger of dropping and without the use of hair or other binding material. It has dovetail mortises cut into the wood.

NEW AGRICULTURAL INVENTIONS.

IMPROVED ANIMAL TRAP.

William Wallace, Tarrytown, N. Y.—The stationary and movable jaws are pivoted together, and extend above the pivot a suitable distance to be closed quickly by a strong string. The stationary jaw has an extension forming a stake, by which the trap may be set up in the ground; also an arm on which the trip for setting and springing the trap is pivoted. The other jaw has a catch for hooking the trip. A lever, on the upper end of which the trip is formed, extends downward to the point where the jaws are to gripe the animal, and carries a yoke to be set in the runway, so as to be moved by the animals in attempting to pass under it.

COVER FOR THRASHING MACHINE TUMBLING RODS.

William R. Wilcox, Sterling Center, Minn.—This cover for the tumbling rods of thrashing machines will allow the knuckle joint to be oiled without removing the cover.

IMPROVED LAND ROLLER.

Fredus B. Hadley, Monterey, Ill.—This consists of an improved land roller, made hollow, and provided with ribs or flanges upon the inner surface of its shell and the heavy inner cylinder.

IMPROVED GRAIN SEPARATOR.

David E. Fisher, Patterson, Ohio.—For operating or shaking the screen shoe, a differentially ribbed and eccentrically mounted revolving cam is employed.

IMPROVED WEANING BIT.

Philip Heak, Toledo, Iowa.—This consists in the hollow bit having a V bend formed in its middle part, and perforated with a number of holes, and provided with the rigid arms. The rigid attachment of the arms prevents the bit from turning in the animal's mouth and getting into such a position as not to be effective.

IMPROVED PLOW.

Robert Cassidy, Thomas R. Lamb, and Chauncey L. Vaughan, Beloit, Kan.—This improved plow is without side draft, and of lighter draft than ordinary plows, and may be readily adjusted to run deeper or shallower in the ground, and to take more or less land, as may be desired. The plowshare is of special form, and has the cutting edge at right angles with the land slide. It is combined with a slotted standard, curved inwardly to bring the plow beam nearly over the center of the share.

IMPROVED WHEEL PLOW.

William A. Ruddick, Carthage, Mo.—This improvement consists of an A frame mounted on the plow beam transversely with a caster wheel on the apex of the frame, to run on the land. There is a larger wheel at the end of one of the bars of the frame, and a tongue connected with the base of the frame. Wheels are contrived for raising and lowering at will to adjust the plow for furrows of different depths, and for carrying the plow above the ground.

IMPROVED PLOW.

David H. Jarrard, Talladega, Ala.—This plow is so constructed that the plow standard may be adjusted to give any desired pitch to the plow, and may be held securely in place when adjusted, and which will support the wing of the plow plate to prevent it from being bent or broken.

IMPROVED MOWING MACHINE.

Charles B. Martyn, Waupun, Wis.—This improves the construction of reapers and mowers in such a way as to convert the long and unequal stroke of the connecting bar into two short and equal strokes of the sickle with a motion of uniform velocity.

IMPROVED BUTTER WORKER.

Charles Plyer, Hempstead, N. Y.—This invention consists of a concave dish with raised center, to which a swinging lever, of a shape corresponding to the dish, is swiveled. This is to be worked all around the dish for cutting up the butter.

IMPROVED GRAIN HEADER.

Charles K. Myers and John W. Irwin, Pekin, Ill., assignors to said Myers and Peter Weyrick, same place.—The object here is to improve the construction of grain headers, so that the reel may be moved farther from and closer to the cutter bar automatically as the cutter bar is raised or lowered to operate upon taller or shorter grain. The device includes five new mechanical contrivances.

NEW TEXTILE MACHINERY.

MECHANISM FOR OPERATING TAKE-UP ROLLERS FOR KNITTING MACHINES.

Ira Tompkins and Albert Tompkins, Troy, N. Y.—This consists of the tension spring employed to regulate the tension of the cloth interposed between the crank rod and the rod for working the take-up pawl lever. It is so arranged that when the machine does not deliver cloth for any reason, as when not making stitches, the spring will compress and allow the crank rod to work its regular course, while the pawl lever will be held by the tension of the cloth until the cloth is delivered from the machine again.

IMPROVED SELVAGE GUARD FOR LOOMS.

John H. Mills, Lisburn, Pa.—This is a wire finger, with a spring lever fitted to a little block, to be so attached to the loom temple that the finger projects down past the selvage at the point where the filling is beaten up, so that the shuttle draws the filling around said finger until it arrives at the box at the other side. The reed then strikes the spring lever, and raises the finger out of the loop after the shutter enters the box. The guard moves along with the temple relatively to the cloth, so that it is always in the right position. There is a guard on each side for each selvage. The object is to make the selvage more uniform and regular than it is ordinarily made.

IMPROVED HOSE GOODS.

Henry G. Hubbard, Middletown, Conn., assignor to Russell Manufacturing Company, of same place.—The invention consists in an improved hose goods, having one or more selvages upon one edge, and two or more upon the other edge, to interlap with each other in forming the seam.

NEW CHEMICAL AND MISCELLANEOUS INVENTIONS.

IMPROVED REED ORGAN STOP ACTION.

Henry Smith, Gananoque, assignor to himself, Joseph George, and Charles Mee, Kingston, Canada.—This consists of a cam lever, pivoted to the key board, and connected to the stop, and so arranged as to act directly on the valve or mute, making a simple and cheap contrivance.

IMPROVED INHALER.

George L. Crosby, Hannibal, Mo.—This invention consists in combining a glass stopper, having an acid receptacle and air passages, with a grooved stopper and tubes. From the acid receptacle the fumes are drawn down through a tube into the liquid in the body of the inhaler, to be inhaled through a flexible tube.

IMPROVED FAUCET.

Patrick Skelly, New York city.—This relates to improvements in faucets for barrels of all kinds, that a tight seating of the stopcock without leakage, and a superior and readily applied coupling with the liquid-conveying pipe, are obtained.

IMPROVED SOAP FRAME.

Daniel Whitaker, Boston, Mass.—This soap frame can be conveniently set up and taken down, and its side and end plates are more firmly connected than others of its class. The base of the frame is made in three parts, secured to each other by transverse screw bolts, whereby they are adapted to enter grooves in the base of frame, and are attached thereto by hooks and staples. The end portions of the frame have clamping bars attached, whereby they may be locked to the sides, in such a manner as to hold the ends vertical, and form a tight joint between them and the sides; and lastly, the side portions of the frame are provided with truss-like braces, whereby they are prevented from buckling, warping, etc.

IMPROVED END FASTENING FOR SUSPENDERS.

John H. Murfey, New York city.—A clip of sheet metal is contrived for fastening one or two ends to the buckle, hoop, loop, or other device, for connecting the end to the principal strap. The said contrivance is such that the clip can be made by stamping or punching it out at one blow of a press, and can be fastened on the strap without sewing, riveting, or other means required to puncture or slit the end.

IMPROVED HARNESS CLAMP.

James McCormick, Glidden, Iowa.—This consists of rubber-faced metal plates for attachment to the jaws of harness makers' sewing clamps, to hold the leather to be sewn without injury to it, and, at the same time, firmly. The said plates are constructed with a groove in the face side, which receives the rubber facing, and holds it without other fastenings.

IMPROVED EVAPORATING PAN.

Sydney S. Connor, Amite City, La.—This consists in an improvement in evaporating pans by providing them with detachable partitions having angle bars to make tight connection with the bottom.

IMPROVED PEDAL ATTACHMENT FOR CABINET ORGANS.

Benjamin L. Boomer, Campello, Mass.—This is a contrivance for closing up the opening in the front of the case for the pedals, and fastening and unfastening the panel which closes it by the desk. The object is to make a better and neater appearance, and protect the instrument from dust, mice, etc.

IMPROVED STOPPER FOR SHIPS' RUNNING GEAR.

John W. Knight, New York city.—The object of this invention is to prevent the chafing and wear of the sail of a vessel from the rope or buntline by which it is drawn up; and it consists of a stopper attached to the mast or any part of the rigging by which the rope is held, so that it will hang loosely over the sail, and so that when the fall of the rope is hauled in, it will let the rope go free.

IMPROVED METAL TOY.

William A. Harwood, Brooklyn, N. Y.—This improvement in toy horses consists of a contrivance of the support by which the horse is mounted on the wheels, so as to be elevated and to make a stronger support than is now used, and yet employ less metal to do it. It consists of a narrow strip of metal or wire, bent so as to make a light support, and at the same time stiffen the metal.

IMPROVED BREECH-LOADING FIRE ARM.

Ira M. Earle, Guilford Center, Vt.—This consists of a hammer contrived to explode the cartridge and close the breech at the instant, the said hammer moving as the radius of a circle, and forming, with the housing, arcs of concentric circles, in such manner that it bears at all times the same relative position to the solid housing, which supports it in its rear, and sustains the shock of the explosion. The hammer cannot explode the cartridge till it is in position to close the breech. The invention also consists of the shell extractor, so arranged that it is operated by slight extension or continuation of the thumb pressure in the motion of cocking the piece.

IMPROVED COUNTER STIFFENER FOR BOOTS AND SHOES.

George W. Simpson, Federalsburg, Md.—This consists in a skeleton counter or back stay made of spring steel, and consisting of the parallel bars and the cross bars, having their projecting ends bent inward to adapt it to be applied to boots and shoes. Its object is to prevent boots and shoes from being run over at the heel.

IMPROVED FISH TRAP.

James McRoberts, Toledo, Iowa.—This is an improved trap for catching fish at the outlet of lakes and ponds, and in other places so constructed as to prevent the escape of the fish within the trap when another fish is entering, and to prevent the smaller fish from being destroyed by the larger ones.

IMPROVED ARTIFICIAL FLOWERS.

Mrs. Eliza F. Penley, Brooklyn, N. Y.—This consists of flowers, leaves, and other articles cut of layers of rattan pith or other wooden strips, wound in continuous strands or coils and cemented together, the leaves being attached to a suitable stem.

IMPROVED PASSENGER REGISTER.

William Mehan, Hoboken, N. J.—In the doorway of a car is pivoted a vertical shaft to which a turnstile is attached. In the floor of the car beneath one side of the stile is placed a weighted platform, of such a size that the passenger cannot step over it. A set of ordinary registering wheels is so arranged as to turn the first wheel of said register through the space of one tooth at each depression of the platform.

IMPROVED LETTER BOX.

France Iersche, New York city.—This consists of a letter box with two or more downward inclined letter spaces, with slotted bottom parts, so that the letters may be seen through the openings in the doors of the adjoining boxes below.

IMPROVED BALE TIE.

Beall Hempstead, Little Rock, Ark.—This improvement consists in a buckle slotted at one end so as to allow the bale band to be fastened thereto by simply bending it around the same, thereby economizing bands; and having at the other a button upon the under side, having two extensions, one of which is larger than the other, which button is adapted to pass through a slot in the other end of the bale band and thus secure the band around the bale. The button may occupy any position with respect to the buckle, and the arrangement is such that to loosen the band the buckle must be brought to a position that the strain of the band will not naturally allow it to assume, thus insuring a secure fastening.

IMPROVED FAUCET ATTACHMENT.

Harry L. Sadler, Brooklyn, N. Y.—This invention consists of a screw threaded bushing of the faucet hole, in connection with an interior tube, having recesses, and a wooden closing plug. The plug tube has interior projections, that are engaged by lugs of a hollow and threaded key that screws into the bushing and carries in a socket with wooden lining, the faucet, opening or closing the keg by the insertion or withdrawal of the faucet key.

IMPROVED FISHING ROD REEL.

Charles L. Noe, Bergen Point, N. J.—This consists of a brake for stopping the overrun of the line after the lead has fallen into the water. It is composed of a plate fixed on a joint, so as to be borne on the spool by a spring, and having a thumb lever, by which to hold it off until the moment the lead strikes.

IMPROVED PROCESS OF RESTORING CRAPE, LACES, ETC.

Aaron Joseph Shriver, Baltimore, Md.—This invention relates to a novel process of cleaning and restoring rumpled and faded crape, lace, and other similar thin material. It consists in immersing the fabric in a specially prepared solution consisting of alcohol, a suitable dye stuff, and shellac, and afterwards subjecting the material to the action of steam, which brings out the color of the dye and crimps the fiber, the shellac serving to hold the fiber in its crimped form, so as to present the original texture of the fabric when new.

IMPROVED COMBINED STEREOSCOPE AND GRAPHOSCOPE.

James Lee, New Brighton, N. Y.—When the lens holder is raised into an erect position it is caught and held by a spring catch, and is thus not liable to fall back and mar the instrument or break the lenses. Wings or side shields are employed to keep the light from the eyes when using the instrument. Said wings may be closed against the lens holder.

IMPROVED TUG BUCKLE.

Herbert C. Ward, Willmar, Minn.—When the draft strain comes upon the buckle the bail slips forward, and the tug is clamped between a cross bar of the bail and a front cross bar of the buckle frame, thus relieving the tongue from the most of the draft strain. The principal use of the tongue is to prevent the tug from slipping when the draft strain is being applied, and to prevent the said tug from working loose.

METHOD OF UTILIZING THE LEATHER OF CARD CLOTHING.

Frank E. Brummit, Walpole, Mass.—This inventor takes the old card clothing as it now comes from the mills and is thrown away, removes the teeth, and gums the leather with gum tragacanth. He then resets the leather with new teeth, pricking the holes in the opposite way to the first setting, so that they will not go in the same holes which they would be liable to do if set in the same direction. The gum fills the old holes, and in some measure restores the leather to the original condition for receiving and holding the teeth.

ANKLE SUPPORTS FOR SKATES AND IMPROVED SKATES.

Julius Drucklieb, Jersey City Hights, N. J.—The first invention consists of an outwardly curved supporting rod that is applied to a socket pivoted to the side of the runner. The supporting rod makes it easier to beginners to learn to skate, while it gives to the accomplished skater a support for the lower muscles, so that he can hold out longer and practice with less fatigue. The second invention relates to such improvements in skates that the same may be instantly and rigidly applied to the heel and sole of the shoe. A set screw allows the adjustment of the skate to any size of heel, while a swinging lever produces, by being carried up until retained by a stop lug, on the runner, the tight attachment of the skate to the boot heel, releasing the same when the lever is lowered and the griping of its sharp edge is discontinued. The front part of the boot or shoe is connected to the skate by an adjustable toe holder.

IMPROVED CARTRIDGE.

Albert Hall, New York city.—This relates to improvements in the construction of paper cartridge shells, by which the same are considerably stiffened, and the anvil rigidly and strongly secured in position in the shell. The invention consists of a diametrical anvil, made in one piece with an encircling socket tube, retained securely by a paper shell and metallic cap piece.

IMPROVED SHOE FASTENING.

William J. Vitt, New York city.—The flap is fastened to the upper by a number of tubular clips applied to the shoe. The clips of the flap and upper are arranged to alternate with each other, and connected by a string that is secured by a knot to the lowermost clip. The string is then passed through all the clips, the upper end giving readily for the opening of the flap in putting on or taking off the shoe. The end of the string is applied to and rigidly retained by a suitable clamping device, and then passed through a hole or eyelet of the upper to the inside to be wound around the ankle.

NEW HOUSEHOLD INVENTIONS.

IMPROVED SASH FASTENER.

Thomas Hill, Portland, Me.—The invention relates to a fastener so constructed and applied as to lock the upper and lower sash together in any adjustment. The fastener consists of a notched and slotted plate, secured to the side bar of the upper sash, and a button or catch pivoted to the top of the lower sash, the arrangement being such that the catch works in the slot of the plate, and engages the notches thereof to hold the sash at the desired hight.

IMPROVED WASHING MACHINE.

Franzis M. Hellstrom, Lawrence, Kan.—The rubbing surface of the suds box is formed by attaching half-round strips of wood at their ends to strips of zinc. The movable rubber is formed by attaching half-round strips of wood to the curved edges of segmental disks. When the levers are arranged in a vertical position their ends rest against cleats attached to disks of the movable rubber, against which they are locked by catches, so that the rubber will be operated by operating the levers.

IMPROVED KNIFE-SCOURING MACHINES.

Herbert Symonds, Troy, N. Y.—In this device the polishing powder is fed downward to the polishing pads from the reservoir. There is also a new mechanical construction of the pads.

IMPROVED BOLT.

Francis Robinson and John H. Ferris, Trenton, N. J.—This consists of a bolt that slides and turns in a barrel by means of an inclined elliptical collar of the bolt bearing on the correspondingly beveled end of the barrel. The bolt is retained in locked position by a shoulder or seat of the handle.

IMPROVED CARPET STRETCHER.

Joseph S. Ingham, Knoxville, Pa.—This is an ingenious combination of lever and pulley for drawing the edges of carpets out taut.

IMPROVED DOOR BELL.

James M. Hinchey, Philadelphia, Pa.—This consists of a bell mechanism operated by a swinging lever that winds up a spring and rings the bell on a release of the pull, by the action of the spring and transmitting gear wheels.

IMPROVED HEATING ATTACHMENT FOR STOVES.

Lars M. Madson, Daneville, Dak. Ter.—This is an improved heating attachment to cooking and heating stoves, by which the heat of the fire gases is more completely utilized before escaping into the chimney. It consists of a sectional pipe, made of jointed elbows at suitable inclination, and supported on the stove and on an adjustable brace standard.

NEW MECHANICAL AND ENGINEERING INVENTIONS.

IMPROVED PROJECTILE.

James M. Pollard, New Orleans, La.—This invention consists in a projectile having a central cylindrical portion, with ends symmetrically tapered to a conical or paraboloidal form, the rear end of the projectile being upset or molded with a raised circumferential bur, which is of less diameter than the cylindrical portion, and has a convex end. The double paraboloidal form adapts the projectile to the least resistance from the air, while the raise bur acts in the nature of a guide, as a feather to an arrow.

IMPROVED FEATHERING PADDLE WHEELS.

John H. Clow, Orange, Wis.—Certain improvements are made in that class of paddle wheels designed for the propulsion of boats in which the paddles are pivoted upon one side of the center so as to feather or move edgewise in rising from the water so as not to carry dead water. The invention consists mainly in the particular construction of a locking bolt, arranged to be operated by a lever and cam, and located in the central part of the wheel so as to engage with the middle part of the paddle, and lock or release the same at the proper time.

IMPROVED PORTABLE DERRICK.

Shirwood Y. Reams, Belleville, Texas.—This consists of an adjustable crane mounted on a truck platform, having an overhead frame for the support of the upper end of the crane post, and braces for staying the frame. The crane can thus be turned around to overhang the sides. The whole is a simple apparatus, which may be moved readily from place to place by hand or by horse power.

IMPROVED WINDMILL.

James Ward, Winnemucca, Nev.—This consists of an upright wheel with spirally curved floats, in connection with a corresponding number of fixed and hinged and weighted shutters, of which the latter are regulated by weights and a connecting governing string.

IMPROVED AUGER HANDLE.

James Magers, Gervais, Oregon.—By suitable construction, a locking plate prevents the bit from turning in the handle when the auger is in use, and at the same time allows the bit to be readily detached and attached when desired.

IMPROVED SAW SET.

Henry Itskin and John Gregg, Rockfield, Ind.—This is a set to be used with the hammer. It has a wedge-shaped notch in the end, and a gage to regulate the position from the side of the saw, so that by placing the notch on the point of the tooth, and hammering the end of the tool, the same as an upsetting gage, the tooth will be set by bending it laterally. There is also an upsetting notch in the tool to adapt it for both kinds of teeth.

IMPROVED NUT LOCK.

Samuel Henry, Chenoa, Ill.—This improved nut lock is formed of a curved plate, having its ends curved upward, and having notches with inclined sides and straight bottom formed in said ends, to adapt it to be applied to the nuts of a pair of bolts.

IMPROVED TIRE UPSETTER.

Ebenezer B. Rose, Goshen, assignor to himself and George M. Bull, New Baltimore, N. Y.—The tire or other iron to be shrunk is heated, placed upon plates, and clamped against toothed blocks by eccentrics. Then one plate and its toothed block and eccentric are forced forward, shrinking the iron.

IMPROVED MACHINE FOR MAKING WEDGES.

John Lennerton, Truro, N. S.—The first part of this invention consists of two revolving cylinders fixed upon a shaft furnished with four cutters in each cylinder, so arranged as to cut the wedges to the required thickness and taper. The second part consists of two other revolving cylinders, similar to the first pair, so arranged upon the same shaft as to cut the wedge to the required width. The third part consists of a circular saw and movable table top, so combined and arranged as to cut the wedge to the required length, and working in conjunction with the other parts.

IMPROVED TIMING ATTACHMENT FOR WATCHES.

Thaddeus Ackley, Warren, Ohio.—A spiral spring is arranged between a top plate and a grooved disk, and serves to throw the disk into contact with the spurred catch at the instant when the lever releases the disk-lifting spring. The spurred catch engages the grooved disk at any position, so as to instantly turn the same with the arbor, and move thereby the second wheel. By pulling out the controlling lever the disk is detached from the spurred catch, and thereby the second hand stopped, the lever being pushed in at the moment when the timing is to begin, so that the second hand moves until, by pulling out the lever, it is stopped again, so that the time taken up by the race is indicated in reliable and convenient manner.

IMPROVED MECHANICAL MOVEMENT.

Miner G. Mosher, Wichita, Kas.—This is an improved device for converting a reciprocating into a rotary motion which has no dead points. It mainly consists in the combination of a U fork, provided with two pairs of hook pawls, with the wheel provided with the bolts; and in the combination of the three three-armed or T bars and their connecting rods or chains with the U bar or fork and with the two sets of hook pawls.

IMPROVED STEERING PROPELLER.

Flavius J. Ashburn, West Union, W. Va.—This consists of propeller blades arranged horizontally on and hinged to vertical crank shafts suspended from a horizontally revolving frame above the water, and connected by their cranks to the crank of a shaft in the center of the carrying frame, and around which they swing. All the paddles thus face in the same direction, so that in the forward motion they turn upon a hinge and work edgewise, and in the back motion they work broadside against the water to propel the boat. This invention also consists of a stationary crank around which the bucket swings, made to be turned in either way, and provided with means for turning it, which may work either by the engine or by the pilot wheel, whereby the direction in which the paddles act is changed at will to reverse the motion of the boat, and to utilize the propeller for steering it.

IMPROVED METHOD OF ANNEALING PLOW MOLD BOARDS.

Eli H. Babcock and John C. Whiting, Canandaigua, N. Y.—The object of this invention is to enable chilled mold boards and other chilled castings to be cooled without warping or being strained, and thus keep them in exactly the required shape. It consists in removing the castings from the chills as soon as they are cool enough to be handled, placing them in hot forms, and cooling them under pressure, and under a gradually diminishing heat.

IMROVED CAR TRUCK SHIFTING APPARATUS.

Robert H. Ramsey, Cobourg, Canada.—This invention consists of a couple of trucks on each side of the track on which is the car whose trucks are to be shifted, carrying a beam extending across from one to the other under the car body at each end. There is a depressed portion of the main track, down which the trucks to be removed run, and detach from the car, while the latter runs on the beam carried by the side trucks, which run at the same time on level tracks. The trucks to be connected are run up the grade, and thus brought into connection with the car.

IMPROVED KEY-HOLE GUARD.

John La Blanc and Xavier St. Pierre, San Francisco, Cal.—This consists of a sliding guard plate operated by a crank pin, sliding in a segmental recess of the face plate of the lock, and in a slot of the guard plate.

IMPROVED AUTOMATIC CAR BRAKE.

Ira Robbins, Hughesville, Pa.—This invention relates to an improved construction of car brake, designed to apply or remove the brakes automatically, or by hand, as may be desired. It consists chiefly in the arrangement of a bellows operated continuously by the car wheels, which is employed for releasing the brakes by acting upon a tripping rod when the cars stop; in the mechanism operating in connection with said bellows; and in devices for automatically applying the brakes by the impact or concussion of the cars.

IMPROVED CAR COUPLING.

Nicholas Darrow, Hempstead, Texas.—The cars are arranged with spring buffers, of which the buffers of one car have side-extending guard plates, to which the tapering heads of the buffers of the adjoining car are fitted. The guard plates guide and assist in the coupling of the cars, and also prevent the cars from swinging too much from one side of the track to the other.

IMPROVED NUT LOCK.

Isaac Van Kuran, Omaha, Neb.—This consists of a washer of steel over a cavity in the fish plate, and surrounding the bolt, so that the pressure on the bolt on the fish plate is transmitted to the surface of the plate surrounding the cavity by the washer. This allows of any required amount of pressure, and at the same time affords a spring with sufficient reactionary power against the nut at all times to prevent it from becoming slack, so as to work off or unscrew.

IMPROVED CAR COUPLING.

Jacob F. Roehm, Hiawatha, Kan.—When the drawheads approach for coupling, the spring-supported links enter the mouth of the corresponding cavities at opposite sides of the drawheads, strike against the pins, so as to throw them back and push them in upward direction on the guides, to allow the passage of the links. When the links have entered beyond the pins, lever handles are thrown forward, and the pins dropped by the concussion of the drawheads, so as to couple the links.

IMPROVED METALLIC GIRDER.

John L. Nostrand, Brooklyn, E. D., N. Y.—In the neck of the head or flange is formed a longitudinal groove or channel, to receive the edge of the web, where it is secured in place by bolts or rivets. By this construction, beams of a greater strength can be made by using the same quantity of iron, or of an equal strength, by using a less quantity of iron, and also, the strain is transferred from the rivets to the shoulders of the heads, against which the edges of the web rest.

IMPROVED WATCHMEN'S TIME DETECTER.

Jacob H. Massey, Allentown, Pa.—This is a watchman's time detecter, which is applicable to a building for inside and outside use. It consists of a dial with concentric circles, revolved by a clock train, and operated by a suitable spring-marking device, in connection with a pull from the inside or outside of the building. The marking device is set for each day by a crank shaft engaging a rack of the marker.

IMPROVED LEATHER-STRETCHING MACHINE.

William Coupe, South Attleborough, Mass.—This is an improved machine for stretching leather for belts and other uses, so constructed as to stretch the leather evenly when varying in thickness, and which may be readily adjusted to stretch the leather to any desired extent.

IMPROVED VIBRATING PROPELLER.

John Forgie, Sr., and John B. Forgie, Jr., Hicksville, N. Y.—This invention consists of carrying paddles in the form of the slats of a window blind, and working alternately sidewise and edgewise to the water as the frames swing backward and forward. The said frames are pivoted at the upper end, in such manner that the lower end works parallel with the engine rod, to which it is connected, to be worked by the steam power applied directly to the rod.

IMPROVED DOUBLE-ACTING FORCE PUMP.

George W. Hooper, Greene, Me.—In using the pump, as the piston moves downward, a vacuum is formed above it, and the water is forced, by atmospheric pressure, through passages and a valve, and passes into the upper part of the cylinder. At the same time the water in the lower part of the cylinder is forced out, opening another valve, and passes into the pump tube and out through it. As the piston moves upward, the water passes in through other openings and valves, and passes into the lower part of the cylinder. At the same time, the water above the piston is forced into the pump tube.

IMPROVED VALVE GEAR.

John E. Giles, Hazleton, Pa.—The crank pin which works the valve is carried in a block in a slotted disk which slides along the disk for shifting the valves, and to the opposite side of the axis for reversing, and is worked by a sleeve on the shaft of the disk to which the shafting lever is connected. The disk is geared by a toothed rim with a wheel on the crank shaft (which gears are eccentric), by which the irregularities of the crank are overcome. For a lap valve, the slot in the disk for carrying the crank pin is arranged out of the center of the line of the axis of the disk to just the measurement of the lap and lead of one end of the valve.

IMPROVED BARREL FOR WATCH SPRINGS.

Sherman D. Johnson, East Haddam, Conn.—This invention consists of the combination of the mainspring barrel by suitable pawls with a separate toothed wheel around the barrel, that is capable of motion independent of the rim on the breaking of the spring.

IMPROVED CAR BRAKE.

Jacob Blanshan, Le Fever Falls, N. Y.—This relates to brakes on opposite sides of wheels, the object being to relieve the axles of the lateral pressure to which they are subject when the brakes apply to one side only.

IMPROVED SHARPENING MACHINE.

George W. Ingersoll and Harvey L. Fisher, Toledo, Iowa.—This is a new tool-holding device, whereby any cutting tool may be sharpened at an exact bevel without help, as one hand can turn the stone and the other guide the tool against the same. By rolling a gage rod, gouges may be ground with the same bevel in superior manner. It is readily adapted to any size of grinding stone.

IMPROVED FURNACE FOR BURNING SAWDUST, TAN BARK, ETC

Frederic T. Kidder, Claremont, N. H.—This invention consists in using feeders under or in the bottom of the mass of the fine fuel, with which the stove is filled. The said feeders are pieces of wood extending from the front at the draft inlet along the stove to the back, and which, being ignited at the front end, burn slowly, together with the sawdust or tan bark immediately around them, while the heat, ascending up the bank of other fuel, converts it into charcoal, and prepares it for burning as it falls down to the fire. In case the fine material is very wet, perforated pipes are placed horizontally in the same, a little above the wood pieces, to conduct some of the heat into the mass, for drying it in advance of the fire, by passing from the tubes up through the fuel.

Business and Personal.

The Charge for Insertion under this head is One Dollar a Line for each insertion. If the Notice exceeds Four Lines, One Dollar and a Half per Line will be charged.

Notes & Queries

H. M will find, on reference, that the den tifrice described on p. 73, vol. 34, is a good one.—F. J. M. is informed that there is no formula for the horse power of a boiler. Ample boiler power for your engine is always to be recommended.—A. L. F. should use marine glue for fastening cloth or paper to wood. See p. 43, vol. 32.—C. W. F. will find directions for etching on glass on p. 409, vol. 31.—H. S. can calculate the speed of his planer by using the formula given for speeds of pulleys on p. 356, vol. 34. He should temper his molding knife to a brown color. See p. 21, vol. 31.—H. H. should cover the copper connections in his Bunsen battery as described on p. 235, vol. 34.—A. A. can temper his millpicks by the process described on p. 106, vol. 25.—W. D. Y. can calculate the lifting power of hydrogen by the formula given on p. 74, vol. 31.—W. H. S. can prevent rust on iron and steel by the method described on p. 169, vol. 33.—V. R. A. will find directions for galvanizing iron on p. 315, vol. 33.—W. L. D. will find a description of lighting gas by electricity on p. 4, vol 29.—G. W. B. will find a recipe for a black japan on iron on p. 208, vol. 26.—W. S. R. will find a description of a process for rendering tallow on p. 439, vol. 34. To bleach tallow, see p. 27, vol. 31.—M. M. M. will find a recipe for a bug exterminating liquid on p. 21, vol. 31.—G. B. M. A. J. W., J. C., J. McC., D. R. P., K. J., L. W., 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) E. J. D. says: I use large quantities of water for irrigation; and at present I raise it by a windmill and pump, but it is very uncertain, as the wind gives out just when it is wanted. Can I compress air enough with my windmill for a two horse power engine? A. We think you would find it more satisfactory and cheaper to pump the water by means of the windmill, and store it in a tank for use during calms. You might compress air by means of the windmill, for the purpose of driving an engine. But the air receivers would need to be larger and more expensive than the water tank.

(2) P. H. S. asks: 1. How can I granulate soft solder to about the size of common shot? A. Melt the solder and pour it in a thin stream from some hight into a vessel of cold water. 2. Does common half hard brass wire in the coil suffer a loss of strength by being exposed to the air? A. The loss, if any, is very slight.

(3) R. T. S. asks. 1. What remedy can I use to destroy the insects which infest the rose bushes? A. Tobacco water. 2. How can I prevent weeds from growing? By hoeing or pulling them up.

(4) A. says: I have been trying to make nitrous oxide gas, but have not succeeded. After I have heated the ammonia for a few moments, the water from the wash bottle comes in to the chemical flask. How can I remedy it? A. Place pure nitrate of ammonia in a capacious flask, provided with a suitable perforated stopper, through which a piece of glass tubing, beat at right angles, just passes. This is to be connected by means of rubber tubing with an empty bottle, fitted in a similar manner to the ordinary wash bottle, with the exception that neither of the tubes must extend to the bottom of the bottle; they should be cut off just on the inner side of the stopper. This will serve for condensing the greater part of the moisture that comes over, and at the same time prevent the retreat of the liquid into the hot flask on the removal of the source of heat; it is well to keep this bottle immersed in cold water during the operation. The purifying bottle may consist of a tall, slender (dry) wash bottle, filled with coarsely broken lumps of protosulphate of iron (copperas). The inlet tube of the purifier must extend quite to the bottom of the vessel, so as to force the gas to pass through the entire column of copperas. When the evolution of gas ceases, the reservoir should immediately be disconnected from the purifier and the stopper removed from the generating flask, before the heat is removed. If these latter precautions be observed, there will be no danger of a retreat even if a wash bottle be employed.

(5) A. L'E. says: Please give me a good recipe for removing paint stains from white shirts. A. Moisten with benzole and cover on both sides with warm pipe clay. Place under pressure for several hours, and repeat if necessary. You should have stated, if possible, what kind of paint produced the stain, to enable us to properly answer the question.

(6) S. H. D. asks: Are the engines of Mr. Corliss at the Centennial exhibition connected on one shaft at right angles? A. Yes.

(7) H. W. asks: What liquid must I add to your mixtures for colored fires in No. 13, vol. 34? I have tried the liquid given in the same number with the result that it will not harden or burn. A. Colored stars may be made by using any of the recipes for colored fires with a mixture of isinglass (pure gelatin) ½ oz., camphor ½ oz., and alcohol ¾ oz. Make into balls of the requisite size, roll in gunpowder, and dry in the sun.

(8) W. L. S. says: The packing box around the stem of the slide valve on my engine has got stuck fast with old tallow and perhaps iron rust, so that I cannot move it either way, and the box needs new packing. How can I loosen it with out taking off the steam chest? The box is of the usual form, set up by two bolts. A. Try driving wedges behind the flange.

(9) W. H. W. asks: What can I add to an iline black so as to keep it black, in dyeing leather? When dissolved in water or spirits, it turns to a brown color. A. Try the addition of a small quantity of sulphate of copper to the liquor; and after dyeing, pass between warm copper rollers.

(10) J. R. C. asks: Is there any known simple and cheap method or process for forming, dissolving, and retaining in perfect solution the protocarbonate of iron, in a common mineral fountain? A. The protocarbonate of iron is by no means a rare salt. It dissolves as completely as bicarbonate in carbonic acid water. Large quantities of the pure carbonate are employed in the preparation of artificial mineral waters. On exposure to the air, the iron is finally deposited as an ochery deposit of the hydrated peroxide.

(11) J. A. W. asks: A friend and myself have had an argument about a vacuum. My friend states that, if we take a cylinder that will stand an external pressure of 25 lbs. to the square inch, we can collapse it with an air pump that is strong enough for the work. I claim that 15 lbs. per square inch is the limit. Who is right? A. The atmospheric pressure upon each square inch of surface equals 15 lbs., so that a boiler capable of resisting this pressure would not collapse under the circumstances you mention.

(12) B. F. G. asks: How is pyrolignate of iron or iron liquor made? A. It is obtained by dissolving scrap iron in pyroligneous acid (crude wood vinegar) and evaporating down until of the required strength.

(13) R. W. C. asks: Is there any way to clear the smoke from a mine with a 100 feet perpendicular shaft, and about the same length of horizontal tunnel at the bottom? A. The usual way is to improve the ventilation by a suitable shaft.

(14) R. W. asks: Can you inform me how to color fabrics to a yellow or fawn color? A. Wash several times in dilute solutions of carbonate of soda and soap, rinse thoroughly in clean water, and bleach with sulphurous acid.

(15) J. S. asks: I cannot get a fine line on tracing cloth. Please tell me how to work it, and how to color plans on tracing cloth. A. Use tracing cloth with one side glazed. The other side has a dead finish, and the cloth will take as fine an ink line as desired on the glazed surface. To color, use the brush only damp with the color, and apply on the back or dead finished side, and the color will show through. Do not get the brush too wet with color, and you will succeed.

(16) H. S. J. says: We are using three boilers for steam heating, and we find a great deal of unconsumed mater al is wasted with the ashes. We use Illinois soft coal on grate bars with $1\frac{1}{16}$ inch openings. A. Decrease the width of openings as much as possible.

(17) A. E. asks: When cold water is suddenly brought into contact with red hot iron plates, as in the case of many boiler explosions, does it become decomposed into hydrogen or oxygen, or is it merely converted into steam? A. It is not at once converted into hydrogen. A small portion of it is converted into steam of a high tension, which buoys up the remaining water and prevents actual contact with the hot iron.

(18) C. W. J. says: Home made potash soap with us will not keep. It has a tendency to spoil, and in a short time it smells badly. We therefore do not put up at a melting as much as we wish. Please inform me what will preserve such soap from this tendency. A. The trouble is probably due to the fact that the conversion of the fat into soap is not complete, either from an insufficiency of the alkali, or that the boiling is not continued long enough.

(19) H. P. J. asks: Will you give me the proportions of the smallest steamboat that can be built for practical working, to make 10 miles per hour in still water? A. Probably it could be made as short as 25 feet. See p. 185, vol. 29.

(20) W. A. H. asks: 1. Is there any metallic compound softer than lead, and that has as high or higher a point of fusion? A. We do not know of such a metal or alloy. 2. What would be the amount of wear upon small steel dies used for stamping lead? A. This could best be determined by experiment.

(21) W. O'H. says: If you take two vessels of equal size, fill one with water and the other $\frac{19}{20}$ full of very finely sifted coal ashes, you will find that all the water in one vessel can be poured into the vessel containing the ashes without any overflow; also that all the ashes in one vessel may be slowly transposed into the vessel containing the water without the latter overflowing. Do the facts prove that $\frac{19}{20}$ of the body of ashes is composed of air cells? A. If you place the same quantity of water in a tube, having about a quarter inch bore, mark the center of the meniscus at the top of the liquid, and finally add the quantity of a hes mentioned. You will find that every grain of ashes introduced will cause a corresponding displacement of the surface mark.

(22) E. C. N. asks: 1. In two water tanks of the same dimensions, the temperature of both and the amount of water drawn from each being alike, in which will a 10 lbs. cake of ice last the longer, the one in which the ice is cut in small pieces, or the one in which it is put in in a large piece? A. Other conditions being the same, the ice in the tank containing the fragments will melt the quicker. 2. Why? A. Because it exposes a larger surface of contact with the water.

(23) F. J. asks: Will an engine 1¾ x 3 inches have sufficient power to run a screw-cutting lathe of 12 inches swing, 3 feet between centers? A. No.

(24) N. W. H. asks: How can I soften small castings of gray iron, so as to drill them with twist drills? They are chilled in cooling. A. If you use carbolic acid with your drills, you need not soften the iron.

(25) G. E. H. asks: 1. What is a pitman rod? A. A pitman has a reciprocating motion at each end. 2. Is the connecting rod of an engine a pitman rod? A. A connecting rod performs a rotary motion at one end.

(26) T. F. M. asks: Please give me a rule for calculating the horse power of a rotary engine. A. There are no known rules applicable to the horse power of rotary engines.

(27) G. E. B. asks: Please give me a recipe for making a face on a fine polishing wheel for steel and iron. A. Use a leather-faced wooden wheel and Vienna lime.

(28) R. C. M. asks: How can I set black carbons in steel cutters, and fasten them immovably? A. Make holes a trifle larger than the carbons; then insert them, and rivet the metal round them with a small set and hammer.

(29) S. A. B. says: How can I make a nice smooth finish on the barrels of cannon stoves? A. Use Albany or Waterford sand, or a facing sand composed of 1 part of coal dust to 8 or 10 of Albany sand.

(30) H. H. says: Please give me a recipe for a cleansing composition or mixture that could be rubbed upon bright steel tools, which can be best heated in lead and, after being hardened in water, will still be bright. A. We know of no method of accomplishing your object.

(31) H. M. A. asks: 1. Can you tell me how to make a cheap and simple battery, or a magneto-electric machine? A. You can construct a gravity battery, one of the cheapest forms, in the following manner: Place a copper disk at the bottom of a jar filled to within one or two inches of the top with water; dissolve a little sulphate of zinc in the water and suspend a zinc disk from the top of the jar. The wire leading from the copper disk should be covered with gutta percha. A handful of sulphate of copper crystals dropped in is sufficient to put the battery in action. Any desired strength of current can be obtained by properly regulating the number and size of the elements. 2. In Mr. M. Alfred Niaudet's machine, illustrated on the first page of your SUPPLEMENT, No. 9, what size and how long should the iron for the electro-magnets be? A. They can be made of almost any dimensions desired; from 1½ to 2 inches long and ⅛ inch in diameter will be found convenient. 3. What sized wire should they be wound with? A. No. 23 will answer for currents capable of overcoming considerable resistance. The size is varied to suit particular requirements. 4. What should the wire be covered with? A. Silk is best, though cotton will do. 5. What should the radial connecting pieces be made of? A. Brass or copper. 6. Is quantity, or high tension and small quantity, better for shocking purposes? A. High tension currents are best for producing shocks.

(32) O. A. W. asks: Is there any substance that, when rubbed on a person's hand, will enable him to hold hot iron and molten lead without being burnt? A. Yes, water.

How can I prepare phosphorus so that it will, when rubbed on a person's hands, remain luminous for 10 or 15 minutes? A. Make the solution in hot olive oil.

(33) D. G. asks: Does the piston of an inclined engine cause less friction on the cylinder than that of a horizontal engine? A. There is no practical difference.

(34) V. W. asks: Do you know of some cheap substance that can be molten and put in around the box in a hub to fasten it after it has been trued? Glue would do if there were some way of solidifying it. A. Red lead mixed with your glue will solidify and harden, and will probably answer your purpose.

(35) S. B. says: It has been asserted that strychnine is used in making whisky, and that traces of the poison may be discovered after the liquor emerges from the distilling process. I applied to Dr. J. R. Nichols, Boston, and he stated that he had never in a single instance found a trace of strychnine in whisky, and that "it is a vulgar notion to suppose that it is ever used by distillers." Is he not right? A. There is no better authority on the subject than Dr. Nichols. If, after examining so many samples, he failed to detect traces of the poison, his statements with regard to the matter are undoubtedly well founded.

(36) E. B. asks: How can I produce chloride of sulphur? A. Chloride of sulphur is prepared by passing chlorine gas over sulphur heated to about 257° to 266° Fah. The product is rectified by distillation.

(37) J. J. says: 1. A friend says that the Corliss engine is always a high pressure engine. He is wrong. 2. Also, that it is not used on any large steam vessels. A. He is right. 3. Also, that a cut-off is never used on low pressure engines. A. He is wrong.

(38) H. J. S. says: I have a glass cylinder fitted with crank, and a silk pad, for an electrical machine. How can I complete the apparatus? A. Mount a tin conductor of two or three inches in diameter, with rounded ends, on a glass rod, and place it in front of the large cylinder. The conductor must be provided with projecting points to collect the electricity. Then make a leather cushion, stuff with horsehair, and attach it to the board mentioned. Attach also, to the upper part of the cushion, a piece of silk which may be long enough to nearly reach the projecting points on the conductor. Better buy the required amalgam for the cushion from an electrical instrument maker.

(39) X. asks: What is the strength of a current of electricity from a small thermo-electric pile, supposing the difference of temperatures between the electrodes to be about 100°, compared with that from a Bunsen pile? A. The value of the current depends upon the resistance in circuit. If this is small, 100 bismuth-antimony pairs may be made to give a current equal to that from an ordinary Bunsen element.

(40) R. R. asks: Which is the cheapest, steam or water, to raise a load of one ton through a shaft 100 or 200 feet deep? A. Water power, if conveniently at hand, would be the cheaper motor.

(41) C. M. B. asks: 1. Please give me the rule for finding the angle for the teeth of a worm gear, the diameter at pitch line and pitch of screw being given. A. You will find it explained in Rankine's "Machinery and Mill Work." 2. Where should a crowned pulley be measured, in the center or on the edge of rim? A. In the center, for determining velocity ratio. 3. Is a cathead that part of a sliding or self-feeding boring bar to which the cutters are fastened, or is it a piece of cast or wrought iron pipe with set screws at each end, to be slipped on small shafting, trued up by means of the set screws, and then held in the jaws of a back rest? A. So far as we know, the term has no meaning that is generally agreed upon. We would be pleased to hear from mechanics in reference to the matter.

(42) F. A. asks: How far will an injector for feeding water to steam boilers draw water perpendicularly? Do you know of any injector which will draw twenty feet? A. An ordinary lifting injector will raise water from 6 to 8 feet. It might be possible to make one lift 20 feet.

(43) M. asks: Why is it that a carriage with large wheels draws easier than one with small wheels? Is it a question of leverage or friction, or both? A. Both.

(44) L. D. M. asks: Is the effect of falling water calculated by the effect that each cubic foot would have, falling the given distance? A. Yes.

At what temperature does the combustion of coal take place? A. It begins at about 1000° Fah.

Why does amalgamation protect zinc when

alone in acid and not when with copper? A. The effect of amalgamation is merely to neutralize the impurities of commercial zinc, which cause local action on its surface when placed in acid water.

(45) G. E. asks: Is the old ship log in use at present, or is there any new improvement for measuring a ship's speed? A. It is still used, but many vessels carry in addition patent logs, which register the speed continuously by the action of a small propeller on gearing which moves indexes.

(46) A. E. D. says, in reply to C. S., who cannot get heat enough from a charcoal fire to do ordinary welding: Be sure that your bellows is in proportion to the work, and that your tweer is set slightly inclined towards the fire bed. First upset the iron so as to make the scarfs a little thicker than is usual in welding with stone coal; and place the iron considerably higher, say from two to fourinches above the tweer and considerably in advance, making sure that the blast passes through a thick mattress of incandescent coals, but never striking the iron. The bulk of charcoal must of course be greater than if it were stone coal.

(47) W. H. P. says, in reply to A. P. McC.'s query as to ventilation of a schoolhouse: I would suggest the placing of a part of the heating surface in chambers, in the basement, into which chambers fresh air from out of doors should be introduced, that it may be slightly warmed. Thence it should be led to the apartments to be ventilated, and brought into the room near the ceiling. In the floor should be registers of suitable size, connected with air ducts, leading to chimneys or to a central shaft, which should be strongly heated to produce a powerful current at all times. These chimneys, or the central shaft, should be so arranged that they may be heated at all times, whether heat is needed in the building or not, thus drawing the foul air out and leaving the fresh air free to flow in to take its place. A. We are aware that the system of ventilation which you propose is the one more generally recommended, where a plan has to be chosen at the inception of a building: but the schoolhouse in question is now provided with a heating apparatus which warms by direct radiation, and which the trustees would no doubt wish to alter as little as possible, provided a reasonable degree of ventilation could thereby be obtained; and it was in view of this state of things that our suggestions were made. However, the theory that the more vitiated air is always at the lower part of the room is not found to be always correct in practice, as those who have had the experience of entering an upper gallery in a crowded church can testify; but where the air has remained undisturbed for some time, and is of even temperature, the bad air, being the heaviest, will no doubt lie upon the floor. In the case in question, the air that has remained longest in the room will be the warmest, the lightest, and the most vitiated, and consequently should pass of at the ceiling. Where the heating is done by indirect radiation the conditions are different and call for different treatment.

(48) R. P. G. says, in reply to J. S., who asks how to make a raw hide perfectly transparent: Take a green hide (a dried one will not do) wash it well, flesh it well, put it in hot water until the hair is loose, which will be in a few minutes, put it on a beam, remove the hair, and put it in cold water. Do not let the water be too hot; try it with a small piece of hide. If it shrinks, add a little cold water. If a printed card is covered with such hide it can be seen as plainly as through a glass. When dry, varnish.

(49) J. V. H. N. says, in reply to correspondents who are troubled with Canada thistles: The mode that I found most expeditious and effective is to wait until the thistles are in full bloom and before the seeds were far enough advanced to ripen, and then mow them down with a scythe, which always ended the curse. The reason for this is that the stalk becomes hollow after the plant blossoms, and after the stalk is cut it fills with water, which rots the roots; and the seeds not being old enough to ripen, the vitality ends. There may be a few plants which have not blossomed, and which therefore will not rot but sprout again, which will require cutting again when they get in bloom; and as they are all cut at once, they will grow and blossom at the same time, so that the second cutting will finish them. I have cleaned a field, that was so full of them that a cow could not be driven through it, in one season by this method.

(50) J. C. W. says, in reply to H. B., who asks how to calculate at what rate of interest, compounded yearly, $2,000 is of the present value of 120 monthly payments of $40: First find the present worth of the monthly payments for one year at simple interest: suppose it 10 per cent, which is $455·67+. Then get the present worth of an annuity of the $455·67 for 10 years at 10 per cent compound interest, which makes the present worth $2828·77, making an error of $828·77, which shows that the rate of interest must be more than 10 per cent. Then call it 20 per cent, and work it the same way, making the amount or present worth only $1902·42. Then by double position, work out the problem and find the rate of interest required, between 18 and 19 per cent. The rule will give a correct answer, but it is a long operation.

(51) To D. N. G., of N. J., and many other correspondents: We know of nothing but poison of some kind that will kill potato bugs; and there is nothing less objectionable, that is effectual, than Paris green. Two tablespoonfuls of good Paris green, mixed with a pail of water and applied to the potato vine (early in the morning, before the insect hides away under the leaves to avoid the sun) by sprinkling with a garden syringe or a whisk broom, will relieve you of your trouble. If the bugs appear on your tomato or other like vines, we would advise picking them off instead of using any exterminating powder.

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

A. C. R.—These are the green and blue carbonates of copper.—A. A.—The magnesium could not be extracted profitably from your rock.—J. F.—It is silicate of alumina (clay) colored by oxide of iron. It is not injurious to the boiler, but its presence in the water is unfortunate, as by its caking upon the surfaces of the iron, and its non-conducting property, a larger consumption of fuel is necessary in order to properly heat the water. An analysis of the water is not necessary, as this sediment reveals the nature of its impurities. The formation might in great part be prevented by filtration, before its introduction into the boiler.—N. W. D.—No. 1 is a fragment of quartz rock. No. 2 is also quartz.—G. B. C.—It is decomposed granite.—D. D. N.—The small piece mineral appears to be a rich ore of copper containing tin. Send us a larger specimen.—J. C. G. —It is not of natural origin; but in what manner this impure iron was formed, we cannot say.—W. G.—True smalt consists of finely crushed cobalt glass. The samples you send are not smalt, but appear to be sand covered by means of some gelatinous substance with various salts of copper, ultramarine, and organic pigments.—W. E. N.—It is iron ore, but is too poor to work.—G. W. McE.—They are iron pyrites, sulphide of iron.—S. K. H. —No. 1 contains mica and hornblende. No. 2 is compact sulphate of lime. No. 3 contains malachite (green carbonate of copper) and copper glance (chalcocite), a lead-colored sulphide of copper.—J. P. G.—No. 1 is titaniferous iron ore. No. 2 is hornblende and mica schist. No. 3 is granite. No. 4 is trap rock. No. 5 is granite. No. 6 is chalcopyrite in quartzoze rock. No. 7 is garnetiferous hornblende rock.

COMMUNICATIONS RECEIVED.

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

On the Age of the World. By E. O. L.
On Steam Pleasure Wagons. By D. G. P.
On Fish Tanks. By A. S.
On a Memorial of the Centennial. By R. P. D.
On a Cause of Fire. By J. S.
On Skylights. By A. B. H.
On the Bessemer Saloon. By A. K.
On Grain Testers. By E. L. W.
On Reading Rooms. By J. O. C.
On the Kentucky Meat Shower. By A. M. E.

Also inquiries and answers from the following:

C. S. B.—W. M. F.—W. L. S.—S. B. L.—T. G. R.—D. K.—E. D. C.—W. J. D.—J. F. H.—C. J. McA.—T. C.—F. C.—U. & H.—C. R.—C. S.—N. S. S.—D. C.—J. P. H.—G. W. C.—L. Z. Jr.—E. L. R.

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.

Enquiries 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 small engines and boilers, and what do they cost? Who makes spiral springs? Whose is the cheapest air pump? Who sells boxwood for engravers' use? Why do not makers of agricultural machinery 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

June 13, 1876,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

A complete copy of any patent in the annexed list, ncluding both the specifications and drawings, will be urnished 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.

Alarm and extinguisher, fire, Nevins & Smith	178,660
Alarm, portable burglar, N. W. Palmer	178,553
Alarm recorder, electric fire, H. Ennis	178,750
Annunciator, electrical, C. W. Holtzer	178,641
Auger, earth, D. N. Root	178,675
Baby tender, T. Shaw	178,680
Baby walker, N. Nelson	178,548
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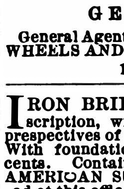

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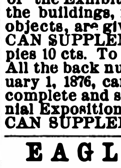

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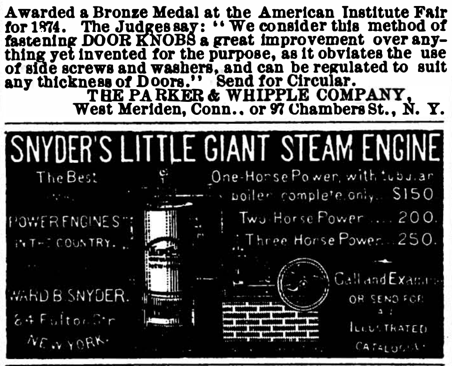

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