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PROCESS AND APPARATUS FOR THE MANUFACTURE OF GRAPE SUGAR.

Probably the most important feature of the process by which the conversion of amylaceous and ligneous substances into grape sugar is effected is the employment, in a gaseous or nascent condition, of a reagent having for its basis either chloric or hypochloric acid. This is obtained by combining an alkaline chlorate or perchlorate with an organic or inorganic acid. For this purpose chlorate or perchlorate of potash and oxalic acid have the preference.

The chief feature of the apparatus shown in our engraving is the arrangement by which the gaseous oxygenating agent employed may be forced from one converting vessel into another, so as to avoid waste.

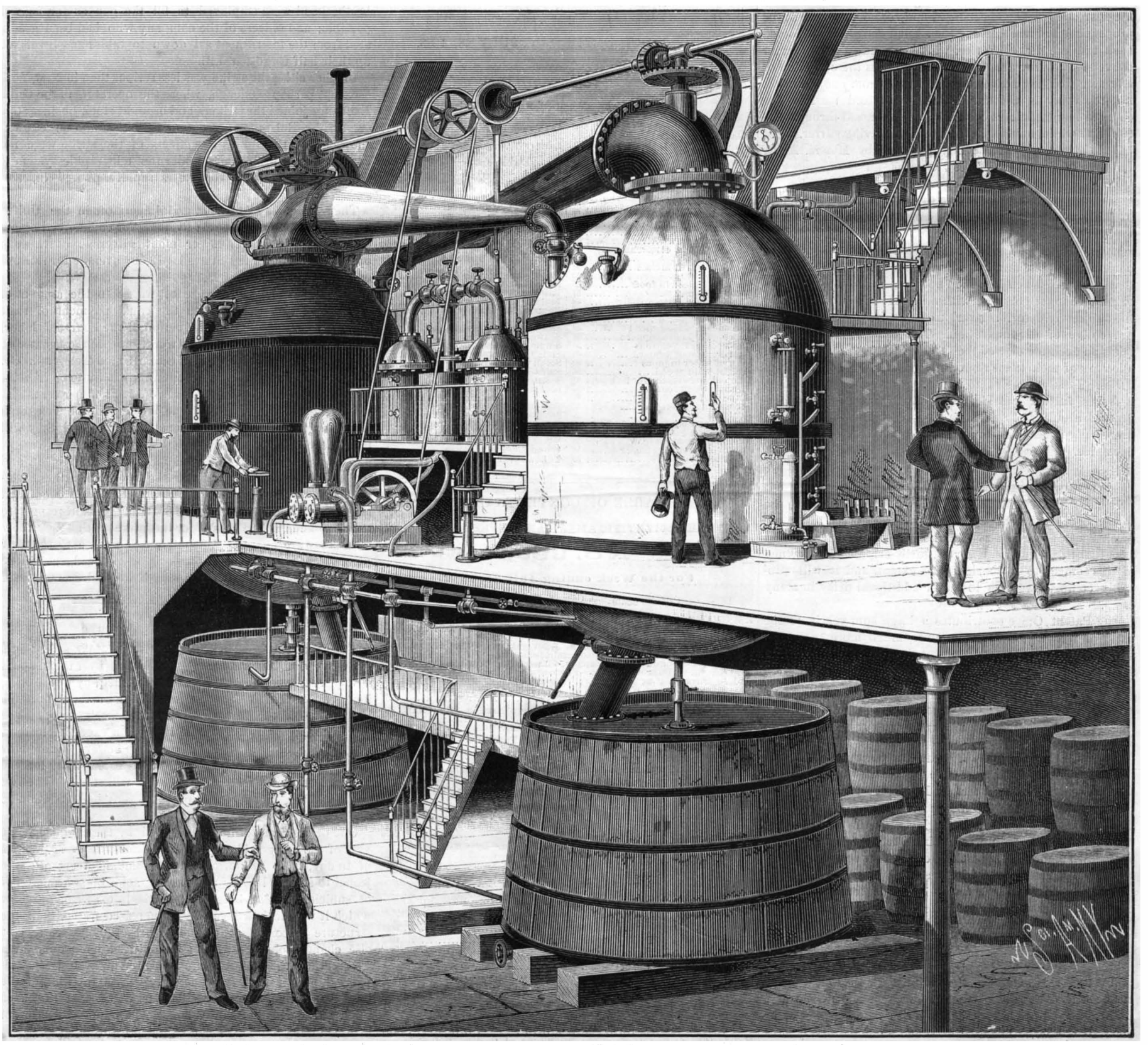
Twin converters, constructed of wood or metal, are hermetically closed. From the upper conical extremity of each converter, a tapered tube extends horizontally to the adjacent converter, passes down through the top of the latter nearly to its perforated false bottom, and is provided with a stop cock. The lower portions of these tubes are perforated to allow free escape of the oxygenating gases that are forced through them from one converter into the other. Beneath each false bottom are two pipe coils or worms, one of which is connected with the gas and air pump at one end, and with a steam generator at the other end, and is also provided with stop cocks, so that either gas or steam may be admitted into the converter. In practice they are admitted alternately. The other coil is closed and connects with the steam generator. It is provided with a stop cock, so that steam may be admitted when required for raising the temperature of the contents of the converter.

Each converter is provided with a liquid gauge, a try cock, a safety valve, and thermometer. Near the bottom of each converter is a sampling tube, having a cock at its lower end to allow samples to be taken when desired, and another cock is provided in connection with the sampler to permit introduction of steam for the purpose of cleaning it.

Above is placed a water tank, from which pipes extend down into the converters. A shaft extends vertically through each converter, and is prolonged into a tank below. Between the converters and tanks the vertical shafts are divided and coupled, so that the lower portion may be easily detached from the upper when required. The shafts are provided with radial arms within the converters, and within the hermetically closed tanks a skeleton frame is attached to them, so that when the shafts are revolved the contents of both converters and tanks are agitated and thoroughly commingled.

The substance to be treated is conveyed into the converters by means of the spouts, and the converted or saccharified matter is discharged into tanks below through a pipe having a sliding valve operated by a lever. After delivery into the tanks, the converted mass is cooled to any desired degree by means of a coil or worm arranged in the tanks, and through which a current of cold water may be conducted from any suitable source of supply. When cooled the contents are allowed to discharge by opening the sliding valves at the bottom of the tanks. The vessels employed for generating the gas used in the converters for effecting the desired saccharification of the grain or other amylaceous body placed therein are placed between the converters, the gas being forced in by a pump.

The operation of the apparatus and the process of treatment of the bodies to be converted into glucose are as follows: The cornmeal or other substance to be converted is



LANDRY & LAUGA'S APPARATUS FOR THE MANUFACTURE OF GRAPE SUGAR.

introduced into the first vessel through the opening. At the same time a quantity of weak glucose liquor obtained in the final washing of the solid residuum in the filter press is inducted through a pipe at the top of the converter. Water is also admitted from the tank. The proportions of the glucose liquor and water may be equal, and the aggregate quantity required is about ten or twelve gallons for each bushel of grain. The agitator is then set in motion for the purpose of thoroughly commingling the contents of the converter. Steam is also simultaneously let into the imperforate pipes, for the purpose of raising the temperature of the mass to 190° Fahr., and when this has been done steam is shut off, all openings are closed, the gas cocks opened, and the commingled gases and atmospheric air passing from the receiver to the pump are forced into the converter through the perforated pipe or worm.

The agitator being kept in motion, these gases readily permeate the mass and come in contact with every particle, so that a very perfect conversion is effected. When the usual tests and reagents—iodine, alcohol, cupric liquors, and the saccharometer—indicate the desired conversion has taken place, the admission of gases is cut off by turning a cock, and a cock on the other side of the converter is then opened to allow discharge of steam from the perforated pipe into the now transformed mass. The action of the steam liberates the gases that are not assimilated, and rapidly forces them out of this converter into the other converter, wherein a charge of meal, weak glucose liquor, and water has been admitted, mixed, and heated to the proper degree (190° Fahr.), while the conversion has been thus going on in the first converter. Thus the gases, which are still chemically active after the conversion of the first charge, are utilized in the treatment of the next, thereby avoiding loss and effecting a considerable economy in the converting process. After the first charge has been converted, the auxiliary gas generators are therefore only required to furnish such additional quantity of gas as is necessary to supply the deficit resulting from the loss of gas which inevitably attends the operation on each charge. While conversion is going on in the second vessel, the first one is being discharged and recharged, and at the proper time the free gases in the second converter are forced back into the first converter, where they effect such further conversion as they are capable of, and thus the operation of alternate charging and forcing of gases from one converter into the other is continued. The converted mass is discharged into tanks and cooled by water passed through the coil pipe while being agitated by the revolving stirrer.

This invention was recently patented by Messrs. A. C. Landry and C. Lauga, of New Orleans, La.

A New Mode of Burial.

At the recent general assembly of cement manufacturers at Berlin, Dr. Fruhling described a new application of cement. He explained that it would be easy to transform corpses into stone mummies by the use of Portland cement, that substance when hardened not in any way indicating the organic changes going on within it. He further illustrated the subject by describing various industrial uses of lime as a preventive of decomposition. The cement in hardening takes an accurate cast of the features which it incloses, thus allowing of their exact reproduction after the lapse of centuries. It is suggested to use coffins of rectangular shape, it being further considered by Dr. Fruhling that underground sepulture is needless, as the coffins soon become practically masses of stone, and can therefore be built into pyramids.

Crippling the Patent Office.

In accordance with legislation by the last Congress, the force of the Patent Office was reduced, July 1, by the discharge of twenty-five clerks. Commissioner Marble says that this reduction will necessarily cripple the efficiency of his office to a considerable extent, and it will probably compel inventors to suffer additional delay in many cases.

The Patent Office contributes a large sum yearly to the national treasury, and is therefore much more than self-sustaining. Justice to the inventors of the country would seem to demand that their business should not be injured and their progress delayed by the mistaken economy of reducing the already inadequate force of the Patent Office.

A Single Coal of Fire.

Property to the value of nearly a quarter of a million dollars was destroyed, one life lost, and twelve persons injured by a fire at a wharf in Brooklyn, N. Y., July 19, caused by a coal of fire being blown from the furnace door of the boiler of a hoisting engine, while the fire was being raked. A cargo of jute was being discharged, and the live coal blown among loose particles of the fiber scattered on the wharf set the material and the adjoining property on fire so quickly that the laborers had to flee for their lives, a number on the vessels alongside the wharf jumping into the water, one of them being drowned.

Large Dynamos and Slow Speed.

Mr. J. E. H. Gordon, the eminent English electrician, has been a strong advocate of small dynamos driven at a high speed. Now, after a costly series of experiments, he finds that a large machine driven at a comparatively slow rate gives incomparably the best result and does not endanger life by flying to pieces.

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NEW YORK, SATURDAY, JULY 28, 1883.

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(Illustrated articles are marked with an asterisk.)

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No. 395,

For the Week ending July 28, 1883.

Price 10 cents For sale by all newsdealers.

LOCK-OUT OF CIGAR MAKERS.

July 19, 1883, will be remembered for two quite important events affecting the relations of employer and employed—the strike of about 7,000 telegraphers all over the country, and the lock-out of 10,000 cigar makers by cigar manufacturers of New York city. The inciting cause of the lock-out was the strike of 250 "Progressive Union" men in a manufactory because the proprietor employed also 26 "International Union" men, who refused to strike to change the end of pay week from Friday night to Thursday night. The employers belonging to the Manufacturers' Union thereupon shut up their manufactories. This closed fifteen concerns and left the employes without work.

This trouble appears to have arisen between the members of two rival workingmen's unions, rather than directly between workmen and employers, and the manufacturers say that if the 26 International Union men had been discharged at the demand of the Progressive Union men, the result would be that in shops where the International Union predominated a similar command would be made to discharge the Progressive Union men, and thus there would be no end of the trouble.

THE TELEGRAPHERS' STRIKE.

July 19, at noon, from the Atlantic to the Pacific, the members of the telegraphic brotherhood, to the estimated number of 7,000, struck work because of a neglect on the part of the principal telegraphic company, the Western Union, to notice their demands for an increase of pay, a reduction of hours of labor to eight hours for day and seven for night, an increased rate for over-work, and an equalization of compensation for employes of both sexes. The sight in New York city at the principal office, when the strike occurred, was remarkable. Several hundred operators, male and female, marched quietly out of the building when the signal was given, and took cars uptown to attend a secret meeting. Other operators not connected with the brotherhood were employed to fill the gap as far as was possible; and officers of the company who had been graduated from the instrument sat down to tables and furbished up their half forgotten skill.

In other cities the strike was less serious than in New York—except perhaps Chicago, where the operators of the Grain Exchange joined the strikers and brought stock business to a standstill. But reports from many cities and large towns showed that the immediate effects of the strike were not sufficient to bring business under the telegraphic system to an end; recruits and volunteers rapidly poured in, and served at least as makeshifts.

The average pay for commercial operators in the United States is $54.43 per month; average for commercial operators in Canada is $37.49 per month; average of railroad operators in the United States is $39.50; average for railroad operators in Canada is $29.12.

The demand for an increase of wages to the amount of 15 per cent, if conceded, with the equal payment of male and female operatives, the reduction of the hours of labor, and extra payment for Sunday work, has been estimated to compel an extra cost to the Western Union Telegraph Co. of at least $1,500,000, and to amount virtually to an increase of compensation to the operatives of about 40 per cent.

It is alleged on behalf of the Western Union Telegraph Company that these demands are excessive; and they will not accede thereto.

It would be difficult to find a more able, intelligent, and industrious body of people in the world than these telegraphers. The quietude with which they have conducted their strike, and the unanimity of their ideas in respect to their demands, afford ground for the inference that they know what they are about. The public will rejoice to see their wages increased and their hours of labor reduced, even if the prices for sending telegraph messages are slightly increased.

THE EXAMINATION OF BRIDGES.

The examination of bridges, relative to their safety, is a matter of vital importance to those passing over them, and is a duty that can only be reliably performed by one having long experience in bridge construction and a thorough knowledge of the mathematical questions involved. The mere running over of a locomotive, or an excessive load, is no guarantee of permanent safety. It is better to know how long a structure will carry an oft repeated light load in safety than how great a single load it will stand. The two seem to bear, for practical purposes, but little relation to one another.

One of the first points to be settled by the engineer is the plan of the bridge: if not in accordance with good practice of to-day, if so proportioned that some members are subjected to strains leaving too small a factor of safety, if not of sufficient strength to carry loads in excess of those for which it was designed, caused by increased traffic, then the structure is condemned without further consideration, or else changes obviating these difficulties are recommended. To ascertain this the parts are measured and the strains calculated, and if found to be safely within the limit of the strength of the iron, all is well so far. The operation also requires the examination of the effects produced by different loads, moving and at rest, and wind pressure.

The care and skill with which the parts were put together, the state of the rivets, bolts, and pins, and the deterioration

of the iron due to atmospheric influences, come up for debate, and where the strength has been materially lessened, new parts are advised to be inserted. The ties, rails, and guard rails, although not entering into the problem of the safety of the bridge in a direct manner, are, nevertheless, responsible for the care of the trains, and are reported upon.

The piers supporting the bridge, and their foundations, present a more difficult task. If the piers are of iron or masonry, the work is comparatively easy. Undue settlement is readily discernible. In the case of pile foundations, the ravages of worms, being below low water line, are hid from view, and the weight the piles will bear cannot always be accurately found. The removal of one pile or more, and the condition of the remainder reasoned from its condition, is safe within certain limits.

If the exact strength of any member be in doubt, or approach too near the limit of its strength, decision is invariably cast in favor of the traveler, and the member is unhesitatingly condemned. That it will probably stand the strain is of no moment and is not thought of; but that it might possibly give way decides the question of its banishment.

HEATING AND HARDENING OF STEEL.

To understand how to properly harden and temper steel tools and other articles is fully as necessary to the machinist now, when most small tools are kept in stock by dealers, as it was twenty years ago, when each shop made its own tools. Lathe and planer cutters, cold chisels, milling cutters, and several other tools and appliances are liable to breakage, and must be redressed at the anvil, refinished, and rehardened and tempered. But many of these tools are ruined in the attempt, and this destruction usually comes in the hardening.

Some mechanics attach much importance to a hardening pickle, but probably failure comes as often by injury in heating the article as by hardening and tempering. An evenly distributed heat of the proper temperature is absolutely requisite to success, and this it is not always possible to assure by heating in an open fire. One portion of the article is liable to be overheated, while another portion is underheated; judging of the amount of heat by color is not always to be trusted; a dark corner or a cloudy day changes the conditions from a light shop and a sunny day sufficiently to make a great and telling difference in the amount of heat judged by sight.

A perfectly reliable method of heating for hardening is by means of the lead bath. It is an easy matter to keep in the shop a crucible or iron pot of lead to be used as occasion demands. The article to be heated for hardening will not suffer when in the lead bath, even if not closely watched, as is necessary at the open fire; the melted lead cannot pass to a degree of heat injurious to the steel. But one condition must be strictly observed—the lead must be pure and clean; it is best to buy the mercantile pig for this purpose. A manufacturer of pipe threading and pipe cutting tools in a New England city, desiring to abandon his old time open fire method for the lead bath, melted a lot of old lead pipe partially corroded, and mixed with it a quantity of type metal. His hardening was a failure until he used pure lead.

In order to harden well it is necessary to heat the article through and through. If the piece is of unusual thickness, as a tap or reamer of three inches or more in diameter, it is better to drill a hole through it from end to end, so that the heating can be even and the hardening be equal. A tap of four inches diameter broke squarely across in the hardening. It was of solid steel. The drilling of an inch hole from end to end was practiced, and a large number of the same size taps were hardened without a failure. The surfaces of the fracture of the broken tap showed plainly the evidences of unequal heating and uneven cooling.

ASPECTS OF THE PLANETS FOR AUGUST.

NEPTUNE

is morning star, taking the precedence of four other planets playing the same role, for the planetary interest during August centers on the morning sky. Five members of the solar brotherhood make their appearance at the beginning of the month in the following order: Neptune, Saturn, Mars, Jupiter, and Venus. This order of precedence they retain throughout the month. Neptune, if he were near enough, would be seen above the horizon about half past 11 o'clock in the evening. Saturn peers above the eastern hills half an hour after midnight. Mars follows in about twenty minutes. Jupiter rises not far from a quarter after 3 o'clock, and Venus follows half an hour later. Thus at 4 o'clock the planetary quartet may all be seen making their shining way among the stars.

Neptune diversifies his course with an event. On the 14th, at 1 o'clock in the morning, he is in quadrature on the western side of the sun, that is, he has reached the half way house between conjunction and opposition, being 90° from either point. He then rises about midnight, is on the meridian at 6 o'clock in the morning and sets about noonday. The same is true of all the outer planets, their apparent movements being regulated by the same law. Observers who keep the run of their conjunctions, quadratures, and oppositions will find it easy to follow their paths.

The right ascension of Neptune is 3 h. 16 m., his declination is 16° 18′ north, and his diameter is 2·5″

Neptune rises on the 1st about half past 11 o'clock in the evening; on the 31st, the rises about half past 9 o'clock.

SATURN

is morning star. Though second in the order of rising, he takes the lead in the order of interest during the month, being a beautiful object in the morning sky after midnight, while every successive rising adds to the brilliancy of his appearance, and makes him more conspicuous among his peers.

Saturn is in conjunction with Alpha Tauri on the 13th at 6 o'clock in the morning. This star is better known as Aldebaran, a brilliant red star of the first magnitude. The conjunction is not a close one, Saturn being, when nearest, 3° 40′ north of the star. Planet and star will however be near enough to make a fine exhibition on the celestial canvas as they gradually approach each other, the pale gold of Saturn being in charming contrast with the ruddy hue of Aldebaran. Heavenly bodies are in conjunction when they are in the same right ascension, a term nearly corresponding with terrestrial longitude. At the same time they may be many degrees north or south of each other.

The right ascension of Saturn is 4 h. 25 m., his declination is 19° 49′ north, and his diameter is 16·4″.

Saturn rises on the 1st at half past 12 o'clock in the morning; on the 31st, he rises about half past 10 o'clock in the evening.

MARS

is morning star, and adds to the interest of the month by an incident in his slow and monotonous course. On the 29th, at 5 o'clock in the afternoon, he is in conjunction with Mu Geminorum, a star of the third magnitude in the constellation of the Twins. Mu is very near the ecliptic, or sun's path in the heavens, and near the point the sun touches on the longest day of the year. The conjunction will not be visible, Mars passing at that time 1° 4′ north of the star. But planet and star will be near enough on the morning of the 30th to make it worth while to watch their approach. An opera glass or a small telescope will assist the observation.

The right ascension of Mars is 4 h. 55 m., his declination is 22° 25′, and his diameter is 5·6″.

Mars rises on the 1st about ten minutes before 1 o'clock in the morning; on the 31st, he rises soon after midnight.

JUPITER

is morning star, and before the month closes will outshine every other star in the firmament. He holds his court in the northeast, in the constellation Gemini, a few degrees south of Castor and Pollux; but no observer of the early morning sky will fail to detect him at a glance. He will soon be near enough for telescopic observation. His return to our vicinity will be a boon to astronomers, who hope to find out something about the intense activity that now agitates his surface.

The right ascension of Jupiter is 7 h. 23 m., his declination is 22° 11′ north, and his diameter is 30·6″.

Jupiter rises on the 1st about a quarter after 3 o'clock in the morning; on the 31st, he rises at ten minutes before 2 o'clock.

VENUS

is morning star, and the last on the list to appear above the horizon. She is traveling south at a rapid pace, being nearly ten degrees farther south at the close of the month than at the beginning. Venus is now near Jupiter, but is rapidly retreating from his neighborhood, approaching the sun so closely that at the end of the month she rises less than half an hour before the great orb in whose beams she will soon be hidden from sight. She has fallen from her high estate, but only for a time. Her peerless beauty will not long remain under a cloud.

The right ascension of Venus is 7 h. 49 m., her declination is 21° 36′ north, and her diameter is 10·4″.

Venus rises on the 1st about ten minutes before 4 o'clock in the morning; on the 31st, she rises at 5 o'clock.

MERCURY

is evening star during the month, presenting but one feature of interest. He is in conjunction with Uranus on the 24th at 10 o'clock in the morning, being at that time fifty minutes south. As both planets are invisible, the event will have to be observed in the mind's eye. To those familiar with the movements of the planets, the pictures visible to the eye of fancy are not always less enjoyable than those visible to the natural eye. They also possess this advantage: Neither clouds nor the great sun himself can obscure them. Mercury makes almost a plunge toward the south during August, his declination changing from 19° north at the beginning to nearly 2° south at the close.

The right ascension of Mercury is 8 h. 58 m., his declination is 19° north, and his diameter is 5″.

Mercury sets on the 1st at half past 7 o'clock in the evening; on the 31st, he sets at twenty-two minutes after 7 o'clock.

URANUS

is evening star, and plods on his way uninterrupted, save by his meeting with Mercury.

The right ascension of Uranus is 11 h. 28 m., his declination is 4° 11′ north, and his diameter is 3·5″.

Uranus sets on the 1st about 9 o'clock in the evening; on the 31st, he sets a few minutes after 7 o'clock.

THE MOON.

The August moon fulls on the 18th at a quarter before 8 o'clock in the morning, Washington mean time. The waning moon is in conjunction with Jupiter and Venus on the 1st, and with Jupiter for the second time on the 29th. She is at her nearest point to Mercury on the 3d, and to Uranus on the 6th. On the 24th, she is very near Neptune. On the 25th, she is in close conjunction with Saturn at half past one o'clock in the afternoon, passing 1° 3′ south. In some portions of the globe between 32° and 70° south declination, where the conditions are right for observation, the moon occults Saturn for the fifth time since the year commenced. The moon completes her circuit of the planets by her conjunction with Mars on the 27th.

STORING THE POWER OF THE WIND.

As suggested previously, no method seems within the range of our present knowledge which can enable us to store the energy exerted by wind currents during the very large proportion of time when we have no need of it, and thus make its whole average force available during working hours. This, which is one of the most important desiderata in mechanics, and which is sure eventually to be secured, debars us from the benefits of the full wind power sweeping around us. But it is perhaps worth our while to consider a plan by which a portion of that power can be utilized, and, of course, just so much steam power with its attendant expense saved.

The wind of this and the adjacent regions has, as the records show, an average velocity of 7·7 miles per hour, being 676 feet per minute. At this rate of motion its pressure per square foot is $\frac{52}{100}$ of a pound, and if we could store the power we might safely calculate on that amount. But for our present purpose this is of small avail. A wind wheel of such size as formerly assumed, 12 feet by 8, gives at that pressure an effect of nominally half a horse power, and whatever it gives during working hours we are prepared to turn to account; at other times it must be of no avail.

The manufacturer or other consumer builds as many of these wheels as he deems best; the more of them the better within certain limits. On the assumption of his needing twenty horse power as before, five of them in the fresh breeze of a summer afternoon will meet the demand, while, with a strong storm-wind, a single wheel will drive his full machinery without assistance. Each wheel sends by its own air-pump its stream of air to a common reservoir. This reservoir is not, on this plan, built to contain stores of energy for future use; it is barely as an equalizer of an unsteady power. It enables the consumer to carry on his work with perfect uniformity of motion, no matter how gusty or squally the wind may be.

He chooses to run his engine, for instance, at forty pounds; setting his safety valve at sixty or eighty, or whatever he may above, he draws a regular forty without change or interruption. The only requisite is that the reservoir pressure shall be maintained sufficiently high. If his wind wheels are doing that amount of work he needs nothing further, and he can easily so construct them that the number of days in which they will need no help will be greatly in the majority in the course of a year.

But days of partial or of total calm will of course occur, and here is where the auxiliary force is required. The steam engine which he would have in use, had he no wind wheels to take its place, is called at once into play, and the machinery runs on, as on other days. The engine drives an air-pump, or pumps, of suitable dimensions, compressing air into the reservoir, that is, it does precisely what the air pumps of the wind wheels failed to do at that moment. This, of course, can be done when there is no wind whatever, and will not unfrequently need to be done when the wheels are moving feebly, and are consequently unable to keep the pressure up to the requisite number of pounds. The two sources of energy are in no way associated; they barely supply compressed air to a common reservoir, for a common purpose; they can work alone or together.

With a sufficiently liberal construction of wind wheels it is not too much to assert that the engine fire would not be lighted on more than one in three of the working days of the year, and the days when it would be needed with its full power would scarcely be one in six. Experience would soon settle all the points required, and though the introduction of the new mode of working would be watched at the first, and very naturally, with distrust, a very short time would remove it, and the two go smoothly on together.

Can any one show any reasons why this theoretical plan cannot become a practical one? It utilizes only a portion of the wind power, it is true, but is it not worth while to save what we can? If a man can save the expense of running his steam engine for two-thirds to three-fourths of the time, at barely the cost of erecting his wind engines, which will run without subsequent expense, it surely does appear that a very decided gain has been made. A.

Nickel Crucibles.

M. Mèrmet recommends nickel crucibles instead of silver ones for use in chemical manipulations. Nickel is slightly attacked by melted potash, and so is silver itself. Nickel crucibles cost at first much less than those made of silver, and they have the great advantage of melting at a higher temperature. It often happens that inexperienced chemists melt their silver crucibles in heating them over a gas lamp; but such an accident is not to be feared in working with crucibles made of nickel.

A CORRESPONDENT says that files may be readily cleaned of grease by holding them for a moment in a steam jet from a blow off cock.

Kefir.

While during the last few years koumiss has been introduced into Western Europe, and even into America, a new drink prepared from cow's milk by a process of fermentation imperfectly understood is coming into use in Russia. This drink is kefir, and it has for long formed the chief article of diet among the mountaineers in the neighborhood of Mount Elbruz and Kasbek, in the Caucasus. It forms a thick white fluid, with a faintly acid flavor, said to resemble certain light wines. The mountaineers themselves call it "ghippo." The inhabitants of the plains near the Caucasus, and the Russian settlers, who term it kefir, kifir, or khiafar, make use of it, not for the table, but as a popular remedy for anæmia, struma, gastric catarrh, and chronic bronchitis.

According to the Moscow *Medical Gazette*, where a contribution on the subject has recently appeared, Dr. Kern being the author, the preparation of kefir is very simple. The mountaineers make it by filling a bag made of goatskin with milk; then a tenacious mass, of the size of a walnut, of a material which they term "kefir seed," and the precise origin of which is unknown, is added to the milk. In a few hours the process of fermentation sets in actively. When prepared in wooden or glass vessels, the kefir tastes better. After a lapse of twenty-four hours a weak kefir is produced; when the process is allowed to continue for three days, the kefir becomes very strong. The source of the ferment is scrupulously concealed by the Caucasian mountaineers, who, with the humor of the English cook who once sold a secret for making "fundied cheese," the "secret" being that the cheese must be fundied after toasting and before the addition of pepper, cannot be persuaded to enlighten strangers to any greater extent than in supplying a small sample of the ferment, in the form of dry, dark-brown, earth-like masses, but steadfastly refusing to say whence they are obtained. One of these fragments dropped into milk begins rapidly to effervesce, turns milk-white, and assumes the form of a mulberry, then fermentation proceeds at once. If a piece, thus transformed, be dropped into another bowl of milk, it rapidly increases in size, and also causes fermentation. Dr. Kern has carefully examined specimens of this "kefir seed," which consists chiefly of masses of zoogloea, holding together collections of a bacterium which he calls *Dispora caucasica*. The yeast-fungus, *Saccharomyces cerevisiæ*, is always found associated with this new germ. "Kefir seed" retains its vitality after remaining for months in its dry condition. Dr. Kern has a great belief in the future of kefir, which has all the virtues of koumiss, and possesses one great advantage over the latter fluid in that it is just as good when prepared from cow's as from mare's milk.—*British Medical Journal.*

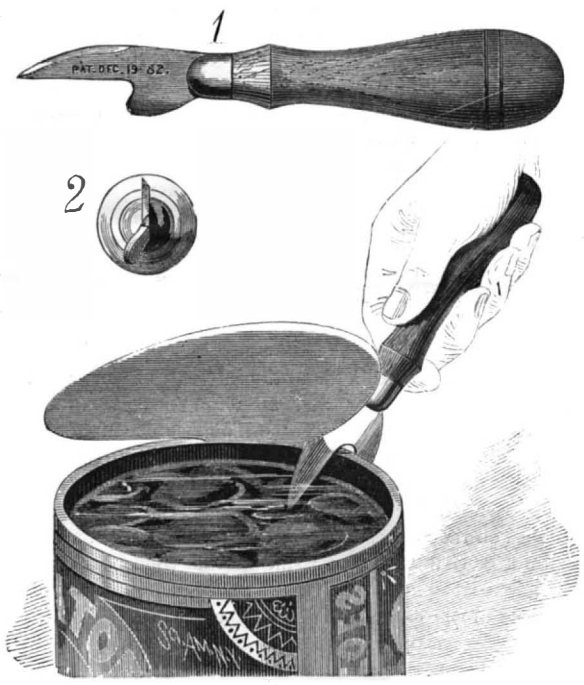
Wood Finish.

The patented preparations known as wood fillers are prepared in different colors for the purpose of preparing the surface of wood previous to the varnishing. They fill up the pores of the wood, rendering the surface hard and smooth. For polishing mahogany, walnut, etc., the following is recommended: Dissolve beeswax by heat in spirits of turpentine until the mixture becomes viscid; then apply by a clean cloth, and rub thoroughly with a flannel or cloth. A common mode of polishing mahogany is by rubbing it first with linseed oil, and then holding trimmings or shavings of the same material against the work in the lathe. Glass paper followed by rubbing also gives a good luster. There are various means of toning or darkening woods for decorative effect. Logwood, lime, brown soft soap, dyed oil, sulphate of iron, nitrate of silver exposed to the sun's rays, carbonate of soda, bichromate and permanganate of potash, and other alkaline preparations are used for darkening the wood; the last three are specially recommended. The solution is applied by dissolving one ounce of the alkali in two gills of boiling water, diluted to the required tone. The surface is saturated with a sponge or flannel, and immediately dried with soft rags. The carbonate is used for dark woods. Oil tinged with rose madder may be applied to hard woods like birch, and a red oil is prepared from soaked alkanet root in linseed oil. The grain of yellow pine can be brought out by two or three coats of Japan much diluted with turpentine, and afterward oiled and rubbed. To give mahogany the appearance of age, lime water used before oiling is a good plan. In staining wood, the best and most transparent effect is obtained by repeated light coats of the same. For oak stain a strong solution of oxalic acid is employed; for mahogany, dilute nitrous acid. A primary coat or a coat of wood fillers is advantageous. For mahogany stains the following are given: 2 oz. of dragon's blood dissolved in one quart of rectified spirits of wine, well shaken; or raw sienna in beer, with burnt sienna to give the required tone; for darker stains boil half a pound of madder and 2 oz. of logwood chips in one gallon of water, and brush the decoction while hot over the wood. When dry, paint with a solution of 2 oz. of potash in one quart of water. A solution of permanganate of potash forms a rapid and excellent brown stain.—*Amateur Mechanics* (*London*).

SIMPLE CAN OPENER.

The engraving shows a very simple form of can opener adapted to all forms and sizes of cans, and capable of cutting out the entire end of the can. The opener is a plain, simple knife, with a lip to rest on the edge of the can, using the can as a fulcrum, as shown in the engraving. It will be noticed that the tool has neither joints nor adjustable parts, and is therefore not a thing to get out of order. Fig. 1 is a side view, Fig. 2 an end view, and Fig. 3 shows the opener in use.

This useful invention has been patented by Mr. Augustus



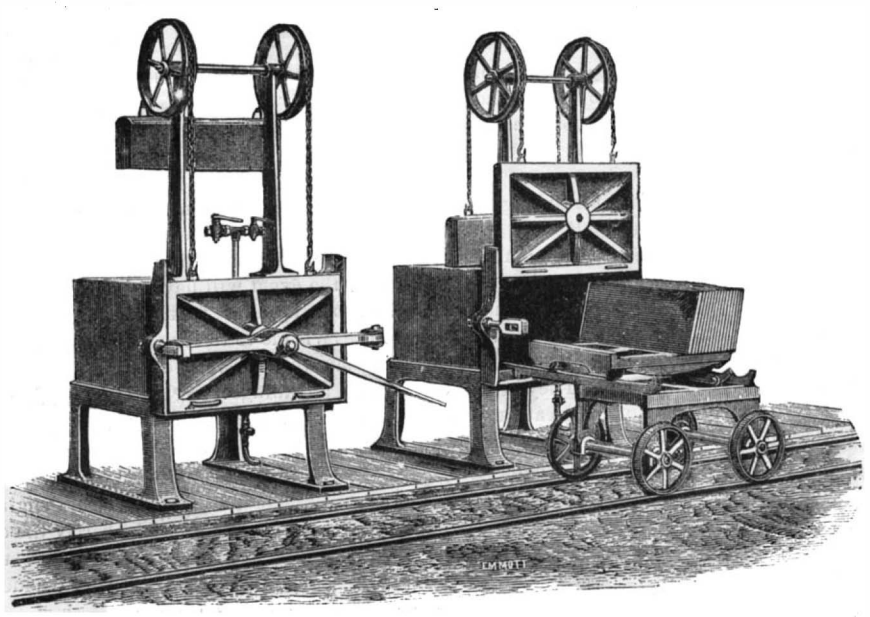
LEAVITT'S CAN OPENER.

J. Leavitt, and is manufactured by the New England Specialty Company, of North Easton, Mass., of which Mr. Leavitt is manager.

STEAM OVEN FOR CLOTH PLATES.

The illustrations given herewith represent a steam oven for use in heating iron plates used by cloth finishers in hydraulic presses. With this apparatus the plates are put inside, and after the door has been fastened steam-tight, steam is turned in and heats the plates to its own temperature. The great advantage of steam heating in this way is that perfect uniformity in the temperature of the plates can be relied on.

The door is balanced and suspended on chains, and opens the oven by lifting vertically in guides. This provides a clear front before the oven, which is not obtained with hinges. The oven, for purposes of strength, is cast from the same mixtures of metal as locomotive cylinders are usually made. To make the joint the faces of the door and oven are planed—a groove being made in the former, to contain an India rubber ring, and a tongue in the latter. The fastening of the door is made very expeditiously by means of the screw through the middle of a forged crossbar, one end of which is hinged to the right hand side of the oven, the other free end entering an eye before screwing up.



STEAM OVEN FOR CLOTH PLATES.

The most noteworthy feature, perhaps, is, says the *Textile Manufacturer*, the adoption of a wagon system of conveying the plates into or out of the oven from or to the presses. This is accomplished as represented in Fig. 2. The rails on the floor run in front of the range of presses, also in front of the range of ovens, and close to all of them.

The wagon that runs on this line carries on rails across its top a smaller carriage, that is usually locked or scotched in position. Upon this upper carriage the plates are piled when coming from the presses. They are then taken to an empty oven, and bridge pieces are laid between the oven and the lower wagon, so as to form rails for the top carriage to be run into the oven with the plates upon it. After heating the carriage the plates are withdrawn similarly. The separate handling of the plate with tongs at the oven is thus avoided, and the whole operation greatly expedited. The longer the plates remain in, up to a certain limit, the more uniformly they become heated, and the better is the finish obtained. It is, therefore, certainly better to utilize the time in heating that in the old plan is occupied in handling the plates.

Cholera.

In view of a possible, but we may still hope not very probable, invasion of cholera, it may be worth while to ask ourselves, seriously and urgently, in what condition will that formidable epidemic disease find us as regards the facilities provided for its rapid extension? In the history of previous epidemics there can be no doubt we may trace the record of progressive limitation and repression by sanitary improvements. The time has now arrived when, with all our light and knowledge, we ought to have no great dread of cholera. It is, in a very special sense, a perfectly controllable *infection*; we do not say that it is so controllable as an *affection*. It remains to be seen whether medicine, as a healing art, has discovered any new remedy, or learnt to apply any known and tried, but not perhaps thoroughly understood, principle of therapy in relief of the malady. What, however, we do assert is that medicine, as a preventive art, in its dealings with the germs of disease, ought to be able to grapple instantly and successfully with cholera. We know that it is propagated solely through excreta, and that water is the great carrier of the infective germs. Obviously, if the excreta of a cholera patient are allowed to dry in contact with the air, they may float away in the atmosphere, and the air will then become infected; but in a primary sense it is the water to which we must look.

In any case, it has been demonstrated that, provided all the excreta from a cholera patient are instantly destroyed—not merely disinfected—the disease will not spread. The malady can no more develop *de novo* than a plant can grow without seed. It is no use waiting until the disease has effected a lodgment in our midst. If choleraic dejecta have passed into the sewers before the nature of the disease has been recognized, as is most likely to happen, the seed has been already sown broadcast, and the production of a crop of cases in some locality—it may be seemingly far from the first case, but in connection with it—will be inevitable. The only effectual safeguard against the epidemic we desire to avoid is to begin at once to destroy *all* diarrhœa stools, lest too late they may be found to have been choleraic! As a matter of precaution we ought always to destroy the stools of fever and diarrhœa. It is wanton recklessness to allow them to pass into the sewers. This is how disease is spread and perpetuated, when it should be stamped out. Whatever disinfectant we employ should be used *at once*, and of strength sufficient to accomplish the object in view. These are hints which should be reduced to practice without delay.—*Lancet.*

Small Wastage on a Large Amount of Work.

The annual settlement of accounts of the Philadelphia Mint for the last fiscal year closed July 6. Representatives of the Treasury Department have for more than a week been weighing up enormous amounts of gold and silver on hand, and arrived at the actual loss in the operations of the institution for the period named. The result of the examination discloses the fact that the wastage of gold and silver in the operations of last year were the smallest on the amount of bullion operated upon in the history of the Mint. The total amount of gold bullion operated upon during the past year was $2,210,944\frac{82}{100}$ ounces, equal to 76 tons. The total amount of silver operated upon was $45,591,338\frac{72}{100}$ ounces, equal to 1,563 tons. The gold coinage for the year consisted of $415,486\frac{56}{100}$ ounces, equal to 14 tons, the value being $7,729,982.50. The number of gold pieces struck and issued was 941,680. The total silver coinage issued weighed $10,551,-908\frac{88}{100}$ ounces, equal to 362 tons, value $12,-325,470.15. The number of pieces of silver coined was 18,798,076. The total minor coins issued weighed $7,315,135\frac{30}{100}$ ounces, equal to 251 tons, value $1,428,307.16. The number of minor coins was 60,951,526.

The legal wastage allowed by law on the gold operated on during the year was $32,-018.33. The actual wastage was $20.77, showing the wastage on gold to be $31,997.56 less than the legal allowance. The legal wastage on the silver allowed by law was $57,293\frac{5}{100}$ ounces, equal to $57,293.05, at $1 an ounce. The actual wastage on silver worked was, 809·23 ounces, equal to $809.23, or $56,483.82 less than the legal allowance. In other words, the actual wastage at the Mint upon the operations on the precious metals was $830.12, while the legal allowance was $89,311.38.

INDICATIVE of the enormous prices paid for rare specimens of orchids, at a recent auction sale at Stevens' (London) a single fine specimen of the Cattleya trianæ alba from Brentham Park collection sold for seventy guineas, or more than $400.

Colored Films on Metals.

According to the prevailing fashion, the small metallic articles used for ladies' ornaments, such as buttons, buckles, clasps, etc., have different colored films produced on them by various methods. (Some of these are known as "oxidized silver.")

Rainbow colors are produced on brass buttons by stringing them on a copper wire by the eyes, and dipping them in a bath of plumbate of soda freshly prepared by boiling litharge in caustic soda and pouring it into a porcelain dish. A linen bag of finely pulverized litharge or hydrated oxide of lead is suspended in the solution, so as to keep up the original strength of the solution. While the buttons are in this solution, they are touched one after the other with a platinum wire connected with the positive pole of a battery until the desired color appears. The galvanic current employed must not be too strong. The colors are more brilliant if they are heated after they have been rinsed and dried.

Colored films are more conveniently produced upon bright brass by different chemicals, by painting with them or by immersion. For example:

Golden yellow.—By dipping in a perfectly neutral solution of acetate of copper.

Dull grayish green.—Repeatedly painting with very dilute solution of chloride of copper.

Purple.—Heating them hot and rubbing over with a tuft of cotton saturated with chloride of antimony.

Golden red.—A paste made of four parts of prepared chalk and one of mosaic gold.

In covering an article with any colored bronze in powder, it is first rubbed with a very little linseed oil, and the bronze dusted evenly over it from a dust bag. It is afterward heated in an iron pan to about 480° Fahr.

In recent times small articles are also roughened by dipping in strong nitric acid, and, after washing and drying, they are coated with a rapidly drying alcohol varnish that has been colored yellow with picric acid, red with fuchsine, purple with methyl violet, or dark blue with an aniline blue. This gives the desired color with a beautiful metallic luster. These latter colors are not very durable, and are used for inferior goods.—*N. Erfind.*

GEAR CUTTING ATTACHMENT FOR LATHES.

Every machinist knows the value of a good gear cutter. It is really a necessity in every well regulated shop, but the expense involved in the purchase of a regular gear cutting engine deters many from investing in such a machine.

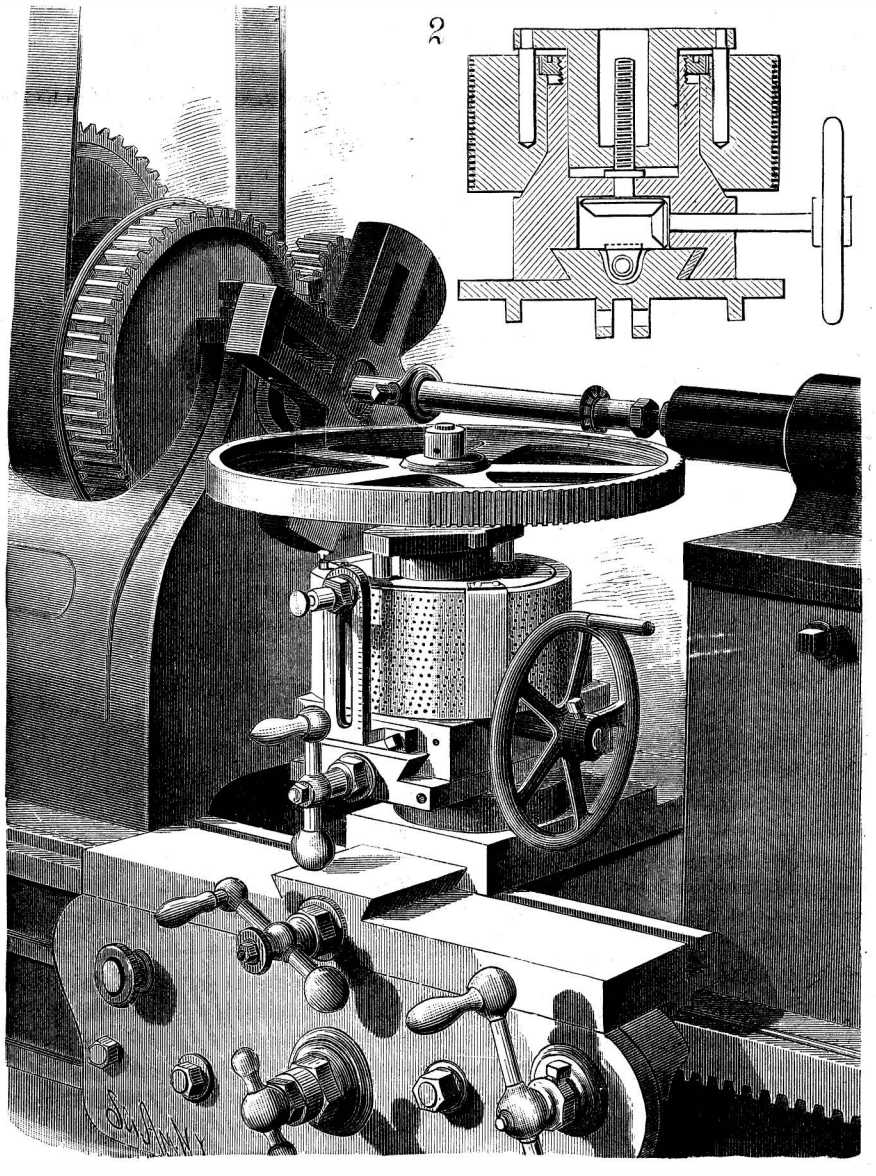
Our engraving shows a very perfect substitute for a complete gear cutter; in fact, when it is applied to a lathe—which is readily and quickly done—the lathe and the attachment together form as complete a gear cutter as can be desired. The gear cutting attachment is mounted in place of the top slide of the tool rest, or upon a base plate of its own fitted to the bed of the lathe. In the present case it is shown as mounted in place of the top slide. The index wheel is mounted upon a tubular standard, which is made conical at its lower end, and is provided with a lock nut or threaded ring provided with holes, which receive a wrench for turning the ring and tightening the index wheel. To the hollow standard is fitted a socket which carries the mandrel upon which the wheel to be cut is mounted.

The socket has at its upper end a yoke carrying two vertical pins, which work smoothly in holes in the index wheel, so that the socket can be raised and lowered without turning when the index wheel is made fast by the lock nut. A screw journaled in the bottom of the standard works in a thread in the bottom of the wheel holding socket, and takes its motion through beveled wheels from the shaft upon which the crank wheel is placed. By turning the wheel, the screw is revolved, and the wheel to be cut is raised or lowered to feed it across the cutter.

Two vertical plates connected by a slotted segmental plate on the top of the index wheel are capable of being set the proper distance apart to divide any of the circles of holes into any required numbers. They serve the same purpose as the sector arms on the ordinary index plate. The stop pin is movable up and down the slotted standard so as to enter the holes of any row.

When it is desired to cut bevel gears the base plate is mounted on a pivot so that the mandrel and the wheel to be cut can be inclined at any angle. The same arrangement admits of cutting worms.

This complete and useful tool has been patented by Messrs. Brooks & Scully, of the Enterprise Machine Works, corner of Fort and Beaubien Streets, Detroit, Mich.

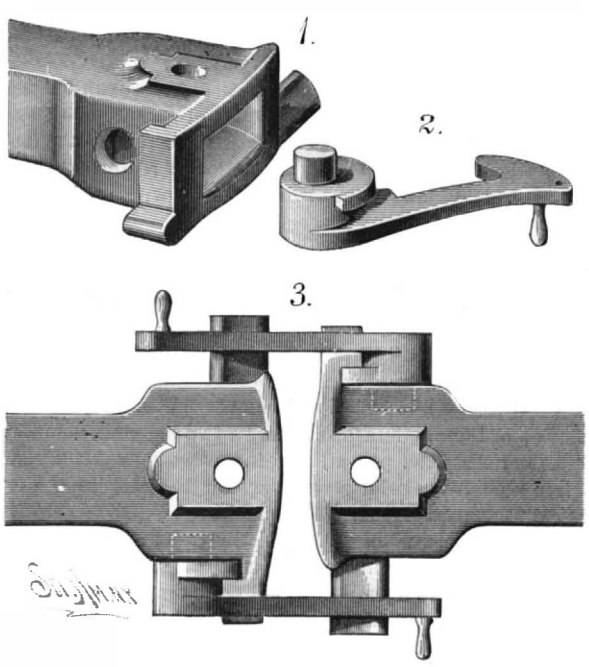


NEW GEAR CUTTING ATTACHMENT FOR LATHES.

A SAWFISH 15½ feet long was taken recently near Halifax, Fla.

NEW CAR COUPLER.

This coupler consists of two parts only: the ordinary pattern of drawhead, but made with a horizontal bar projection on the one side, and a hole or socket on the other side, as shown in Fig. 1. This hole receives the shaft of the coupling hook shown in Fig. 2, which is made with a half collar at its base, working in a recess of the drawhead in such a way that it cannot come off. No fitting with screws, bolts, springs, etc., is required, it is inexpensive, and the breaking of a drawhead involves no more loss than with the usual form. The coupling action is that of latching, the hook of each drawhead sliding up and dropping over the respective horizontal bar projection of the two drawheads.



AMBROSE'S AUTOMATIC FREIGHT CAR COUPLER.

A double coupling is thus made without the attention of a brakeman at all, as 50 or 100 cars can be coupled by merely backing the engine, the hooks always resting in horizontal position ready for coupling. Its simplicity prevents its getting out of order.

A link and pin can also be used in the ordinary way, and with the same facility as at present. The coupling can also be arranged to uncouple from the sides or top of a car if so desired. This invention has been patented by Mr. Thomas H. Ambrose, of Port Hope, Ontario, Canada.

IN Krupp's great gun manufactory, at Essen, compressed carbonic acid is used for the manufacture of what ice and seltzer water may be required by the workmen.

Renovating Old Oil Paintings.

In cleansing old paintings that have become dingy with soot and coal dust, substances are frequently employed that injure the painting by acting on the lighter and more delicate tints and shades.

Von Bibra has discovered a method which, according to Wieck's *Gewerbe Zeitung*, is both safe and rapid.

The painting is first removed from the frame, and the dust and smoke brushed off with a pencil or feather. After this it is washed with a sponge dipped in well water. It is next covered with a thick layer of soap; shaving soap is the best for the purpose, because it remains moist and does not dry on. After the soap has been on eight or ten minutes it is all washed off with a strong brush or pencil, adding a little water if necessary. The soap that still adheres is rinsed off sufficiently with water, and the picture left to dry.

When completely dry it is further cleansed with nitro-benzol. This chemical preparation is also known as nitro-benzine, artificial oil of bitter almonds, essence of mirbane, and is a yellowish, oily (*very poisonous*) liquid, with a powerful smell of bitter almonds. It is formed when coal-tar benzol is mixed with fuming or concentrated nitric acid under suitable precautions. The nitro-benzol is poured into a dish or soup plate, and a clean linen rag dipped in it, and passed over the painting. This quickly removes all the adherent dirt. This linen rag must be frequently exchanged for a clean one. When the rag remains clean after going over it repeatedly, the cleansing is finished.

If the colors look dull after going over it the last time and letting it dry, it is given a thin coat of the finest olive oil, and after a while must be varnished with a good, quickly drying varnish.

It is claimed that the dirtiest oil paintings, when cleansed as above described, acquire their original colors and freshness.

Patents in the United States.

There is no country more favorable for the inventor than the United States. By wisely-framed patent laws, which are vastly preferable to bounties, inventive genius is stimulated to action, and the cost of obtaining patents is so light as to debar few from the privilege. In this respect the United States presents a marked contrast to England, whose patent fees are much higher than our own. In England the cost of patent protection for fourteen years amounts to about $875, whereas America protects her patentees for seventeen years for the sum of $35. An English trade journal not long ago asserted that England was getting somewhat behindhand in her struggle for manufacturing supremacy, owing to the excessive cost of obtaining patents in that country, and pointed to the United States as an example worthy of imitation in this respect. Perhaps the American has a keener insight into the requirements of the age and a greater versatility of resources than his English brother, but these traits have surely been developed through patent legislation.

It is unnecessary to touch on that phase of communism which opposes the granting of patents, or at least wishes to restrict the time of such to insignificant periods which will not recompense the inventor. Of course it is but a simple act of justice to secure to the inventor the result of his brain labor, as well as to the workman in other fields of industry the result of his hand toil. One apparently simple, yet important, tool used in shoe manufacture required seven years to perfect. The inventor should certainly receive remuneration for his time and application. Patenting may be considered a kind of technical education, and though inventors may produce thousands of worthless articles, yet there is sufficient gold out of the dross to make our patent system worthy of all encouragement.—*Manufacturers' Gazette.*

Swelled Rifle Barrels.

A board of officers, with Capt. Greer as president, has tested a lot of rifles at the Springfield armory to determine the cause of the bulging of the barrel, which occasionally occurs in practice. They find it due to the fact that the muzzle has been stopped by sand, caused by resting the muzzle in wet sand, or in dry sand after the gun has become foul from firing. This arrests the passage of the ball, so that the pressure is increased at the point of swelling. It is curious that sand produced this result where wooden plugs, driven in tightly and swelled by steam, failed to do so.

A NEW lighting appliance has been invented by M. de Khodinsky. He directs a jet of coal gas and of oxygen on a specially prepared prismatic pencil of magnesia. The coal gas and the oxygen arrive at the point of combustion by two separate pipes inclosed in the same tube.

THE STURGEON FISHERY.

BY H. C. HOVEY.

Having recently enjoyed facilities for informing myself as to the methods and results of the principal sturgeon fisheries in this country, it may be supposed that some of the facts thus gathered may be of general interest.

It seems that, in the month of May, when sturgeon most abound, the market is usually supplied with other and choicer varieties of fish. Hence, until recently, this really valuable food fish has been neglected and its commercial importance underestimated. This difficulty has been met and overcome by the enterprise of New York packers. The process consists in placing the sturgeon, as soon as caught and dressed, in a large freezer, where, by a patented method, they are frozen solid as they lie in boxes. This process is so perfected in the works at Salem, N. J., that 125 sturgeon, averaging 85 pounds each when dressed, can be frozen every seven hours. The fish are afterward taken out of the boxes and stored in large rooms, through the center of each of which a freezing apparatus extends that is charged anew every day. By this means the fish can be kept for months until they come into demand.

The sturgeon range from Georgia, in winter, to St. John, N. B., in summer, and are followed up throughout the season by men expert in their capture. Large gill nets are used in this business, each about 200 fathoms long, and with meshes a foot in size. The Delaware River is the principal field of operation. Sturgeon enter this stream about the 22d of May, and in such immense numbers that nets about a quarter length have to be used, larger ones being at that time unmanageable. Mr. Blackson, an experienced fisherman, tells me that he has seen them so abundant that his net would sink with their weight as soon as it was thrown out. The average catch per net is from twenty-five to thirty fish apiece, at each cast. This lasts about two weeks. The sturgeon move steadily up stream toward the head of the river, and then suddenly disappear about the 10th of June, after which they must be sought elsewhere. How they get out of the river without being caught is a mystery. All that the fishermen know about it is, that one day they are busy catching fish, and the next all their nets are empty!

The boats used in this business are all constructed on the same general plan; about 24 feet keel, 7 or 8 feet beam, capable of carrying about thirty sturgeon apiece. A boat load of big ones looks, oddly enough, like a load of small logs!

The flesh of the sturgeon, as is well known, is rather coarse and oily; and, as much depends on its right preparation for the table, we took some pains to inquire how it is cooked by the wives of the fishermen themselves, who ought to know as well as anybody, seeing that it constitutes a staple article of their diet. From several methods recommended, we give the two that seem the most promising:

The first method is to cut the flesh into slices and parboil them to get rid of the superfluous oil, and then fry them in a thin batter.

The second method is to cut up the meat into squares two inches thick, which are to be thoroughly boiled, and then pickled for two days in spiced vinegar, after which they are ready for eating, and are considered excellent by the fishermen.

The usual way of preparing sturgeon for market, however, is by smoking. Strips an inch or two thick are put through a pickling process, then hung on hooks over a slow fire of corn cobs or sawdust of hard wood. After thus smoking for a single night they are ready to be shipped to any part of the country.

The preparation of caviare is an important part of the business. While this is not yet in as general use in this country as in Russia and other parts of Europe, where it is so highly esteemed that no repast is served without it, it is coming into favor, especially in the Western and Southern States. There are two sorts of caviare, the soft and the hard; the latter being worth about twice as much as the former. The value of the best hard caviare, in the South, early in the spring, is said to be from fifteen to twenty cents a pound.

In order to make the best article it is necessary to strip the roe from the sturgeon as soon as possible after the fish has been caught. Before being dried, it is rubbed through a coarse sieve to break the eggs apart, and to free them from membranous tissue. Next the roe is thorouhgly salted; after which it stands a certain length of time. Then it is emptied into fine sieves, where it remains till it is so dry as to roll like shot. The finished caviare is packed in casks previously lined with napkin linen, each layer being salted with fine table salt. Each keg holds about 150 pounds. With proper care, the caviare may be kept for a year or longer. For the trade it is often canned like fruit, in which condition it will stand transportation to warm countries, and will keep an indefinite length of time. It may be eaten as put up without further preparation; though it is thought to be improved in flavor by the addition of a little vinegar or lemon juice. Pressed caviare is a favorite with Russian soldiers, who are said to take a liberal supply in their knapsacks whenever they are going on a long march. Improvements might be made, no doubt, in the preparation of American caviare, and the subject is worthy of receiving the especial attention of packers.

"RIGHT-HANDEDNESS" extends very far along the animal series. Parrots hold their food by preference in the right foot, and, though we cannot speak positively, wasps, beetles, and spiders seem to use the right anterior foot most commonly.

Red, White, Blue, Green, and Violet Prints.

AT a recent meeting in this city of the Association of Operative Photographers, as reported in *The Photographic Times*, a large number of blue prints were exhibited by Mr. Heckel, and he gave his method of making them as follows: Take 1 oz. citrate of iron and ammonia in 7 to 8 oz. of water, and another solution of 1 oz. red prussiate of potash in 7 to 8 oz. of water; coat your paper with a Buckle's brush, applying the iron solution first, and when dry, coat with the prussiate solution, and the paper is ready for exposure. To judge of its proper time requires experience. Fix and wash in plain water only. Red prints are made by coating paper with a solution of 15 grs. nitrate of uranium to 1 oz. water, with which the paper is coated. Print till the image is fairly visible, and apply a solution of red prussiate of potash, which renders the print of a brownish red color. This has been done very successfully.

Mr. Ehrmann: The addition of liquid ammonia to the citrate of iron and ammonia solution, when employed for the making of blue prints, varies the tone of blue to such an extent that even a perfect violet has been attained. Red prints, as mentioned before, can also be modified to a variety of colors. He thought weaker solutions may possibly give better results as to color. He employed a one per cent. solution of the uranium nitrate and a two per cent. solution of the red prussiate. An after treatment with sesquichloride of iron renders the print green. By varying the strength of the solutions employed, different shades of color may be obtained. His experiments on gelatine positives, the results of which were laid before them some time ago, had convinced him that in a similar way all gradations of color from canary yellow to emerald green, and positive blue again, can be as readily obtained on a surface of paper as on gelatine.

Mr. Powers gave as his mode of making blue prints:

Solution No. 1.

Sesquichloride of iron	6 grains.
Chloride of copper	44 "
Hydrochloric acid	5 "
Water	1 ounce.

Coat and dry in dark room.

This paper is very sensitive to light. Expose and develop with

Solution No. 2.

Sulphuric acid	4 grains.
Sulphocyanide of potassium	9 "
Solution No. 1	10 "
Water	4 ounces.

The tone is blue, but may be changed to red and gradations of other colors with ferricyanide of potassium 30 grains to 1 ounce of water, and perchloride of iron as demanded. Fix with acetate of lead.

Mr. Murphy stated that he makes a very fine red on plain silvered paper by using 1 grain of chloride of sodium to 1 ounce water, into which the paper is immersed and very speedily removed. Sensitize with neutral nitrate of silver, 10 grains to the ounce. Fix in hypo. 1 to 32, made strongly alkaline with ammonia. Prints of that kind are frequently made for certain engraver's purposes, for which the silver deposit is finally bleached by bichloride of mercury.

Mr. Grenier: Dioxide of manganese and hydrochloric acid remove the yellow tone often remaining after the use of mercury.

Mr. Murphy: This bleaching may be effected to greater perfection with perchloride of iron.

The Flow of Water in Pipes.

Mr. Hamilton Smith, Jr., has prepared for the transactions of the American Society of Civil Engineers a very valuable record of experiments undertaken with the object of redetermining the laws governing the flow of water through pipes. The experiments were 88 in number, and conducted under widely differing conditions as to dimensions of pipes, bulk of water, and every other factor that has been recognized as affecting the result.

It is well known that American engineers have exceptional experience in the conveyance of water in pipes under extraordinary pressures, particularly in connection with Californian hydraulic mining operations. Of the experiments referred to 71 were made by Mr. Smith personally, with pipes ranging from 4 feet to ½ inch diameters, and with velocities varying from 20 feet to ⅛ foot per second.

The materials of which the pipes were made were wrought sheet and cast iron, glass, and wood; and their interior surfaces varied from the almost perfect smoothness of glass to the roughness of old iron much incrusted by the continued action of soft water. It appears from Mr. Smith's incidental observations that the common Californian practice, for water with heads of about 200 feet, is to use pipes made of common No. 14 sheet iron, single riveted, pitched inside and out, and simply put together, stove-pipe fashion, with slightly conical joints.

Details are given of the discharge of a pipe belonging to the Spring Valley Mining Company, laid in 1876, and said to remain in perfect condition. This pipe is made of double riveted sheet iron, three-eighths of an inch thick at the point of greatest pressure, where the actual head is no less than 887 feet. The maximum tensile strain on the iron is 17·549 pounds per square inch.

Round stones weighing about 25 lb. passed through the pipe with a velocity of nine feet per second, while the computed velocity of the water is 10·78 feet per second. It may be remarked, however, that the value of m, the variable coefficient depending upon the character of the interior of a pipe, is very low with small, rough pipes, while it increases with the velocity for smooth pipes, and also increases with the diameter. The importance of this question to the hydraulic engineer is manifest from the fact that the experiments show a variation in the value of m from 33 to 67.

An Inexhaustible Fish Supply.

In the opening lecture before the Fisheries Conferences, in London, Professor Huxley presented facts substantiating his statement that in fishing districts an acre of sea was more profuse in food production than an acre of land. He said that he had no doubt that there were some fisheries which were inexhaustible. Instancing the salmon rivers, he said it was quite clear that those who would protect the fish must address themselves to man, who was reachable by force of law, and that it not only might be possible, but it was actually practicable to so regulate the action of man with regard to a salmon river that no such process of extirpation should take place. But if we turned to the great sea fisheries, such as cod and herring fisheries, the case was entirely altered. He believed that the cod, herring, pilchard, mackerel, and similar fisheries were inexhaustible, and were entirely beyond the control of man, either to diminish the number of fish or to increase them by cultivation. But there were sea fisheries capable of being cultivated and controlled, in part at least, by man.

Seaweed for Boilers.

A new material for coating boilers, etc., for preventing radiation of heat, is described by Mr. Edward Stanford, F.C.S., as made of charcoal cemented by the new substance "algin," which he has succeeded in separating from the commoner sorts of seaweed. Charcoal has long been known as one of the best of solid non-conductors of heat. It would have been employed for this purpose before now but for the difficulty of agglutinating it. Mr. Stanford's "carbon cement" consists of 97 per cent. of charcoal and 3 per cent. of algin, which is quite sufficient to make it cohere. As the charcoal itself is made from seaweed, it is a somewhat remarkable fact the whole covering is thus made from the one material.

The solution of algin is also described, on the authority of Mr. Spiller, as the best thing yet discovered for arresting or preventing incrustation in steam boilers. Mr. Stanford describes most of the troublesome incrustations as organic compounds combined with alkalies. The algin solution is said to be highly efficacious in precipitating the lime in such a fine state of division that it can be easily blown out. It follows, therefore, that seaweed, in one form or another, is proposed as an excellent internal and external application for steam boilers.

Yellow Fever.

Dr. Dominigos Freire, appointed by the Brazilian Government to investigate the nature and cause of yellow fever outbreaks, has reported some of his researches. He has found in the soil of cemeteries where yellow fever subjects have been interred myriads of microbes identical with those seen in the vomit, blood, and urine of patients suffering from the fever, as well as vibriones in rapid motion. Dr. Freire believes that, after passing through the porosities of the earth, these germs disperse themselves in the atmosphere, while others are carried by storm rains to the towns, and there provoke epidemics of the disease. He proposes that the bodies of all persons who die of yellow fever be cremated.

Blinkers.

The question has often been asked, "Why do horses wear blinkers?" We cannot answer the question. It seems to us that they are useless, ugly, and, to some extent, injurious to the eyesight. The most beautiful feature of the horse is its eye. If it were not "hid from our gaze," it would serve to denote sickness, pain, or pleasure. Many a time would a driver spare the whip on seeing the animal's imploring eye. The argument in favor of blinkers is, we believe, that horses are afraid of passing carriages. This objection, if valid, is of little weight, as such timidity would soon be overcome. We trust, now the cruel bearing rein has been cast aside, that blinkers will also be abandoned—a course which would, we feel assured, be attended with advantage to both man and horse.—*Lancet.*

The Illuminations at Moscow.

The following are details by which the illuminations at Moscow at the coronation were produced:

The Tower of Ivan the Great and its side galleries were lit up by 3,500 small Edison lamps, worked by 18 portable engines, which moved a number of dynamo-electric machines of every existing system. The portable engines and machines were kept at the other bank of the Moskwa. The sheds communicated with the tower by 70 overhead wires. On the ramparts of the Kremlin toward the river eight large and ten smaller electric suns threw their light over the river. The rest of the illuminations consisted in 200 000 lamps and 30,000 colored glass globes, 50,000 lanterns of Venetian glass, 600,000 tapers, and 10,800 pounds of fireworks.

Correspondence.

Photographing the Vocal Organs.

To the Editor of the Scientific American:

I notice in your last issue an article on "Photographing the Larynx," in which you give the credit of having successfully photographed the vocal organs to certain scientists in England. A year ago last May, Dr. T. R. French, of Brooklyn, presented to the American Laryngological Society, at Boston, several views of the larynx, taken in Brooklyn a few days previous to the meeting and taken with ordinary sunlight. On (or about) May 23 last, he read a paper on the subject before the same society at their meeting in New York, and presented numerous pictures of the vocal organs in health while producing sounds, as well as several views of diseased states of the larynx, tumors, etc., all of which were taken with a small apparatus held in the hand, a mere attachment to the usual laryngoscopic mirror.

Besides this he presented several pictures of the post nasal passages, the photographing of which has never been attempted before. The medical journals of about that date gave a full report of the matter. I call your attention to these facts, with the thought that perhaps you might wish to accord to American experimentalists the credit that is due them.

GEO. B. BRAINERD.

23 Lafayette Avenue, Brooklyn, N. Y.

The Remarkable Shark.

To the Editor of the Scientific American:

The communication of Mr. W. Morey on the capture of "A Remarkable Shark" (*Rhinodon typicus*) off Ceylon is of interest, and is the first notice of its discovery there that has come to my knowledge.

The occurrence of the species in the Singhalese waters is not, however, very wonderful, for the sharks have so wide a distribution, and are such great rovers, that they may turn up on the most distant coasts.

It has, indeed, been remarked by Dr. Günther, an English ichthyologist, that the rhinodon "does not appear to be rare in the western parts of the Indian Ocean, and possibly also occurs in the Pacific." It grows to a larger size even than Mr. Morey supposed, and, according to Günther, "is known to exceed a length of 50 feet, but is stated to attain that of 70 feet." Mr. Morey is mistaken in supposing that it is "destitute of teeth;" it has, in fact, extremely small but numerous teeth of a subconic form, and in many rows. The rhinodon in the smallness of the teeth agrees with the great basking shark (*Cetorhinus*, or *Selache*, *maximus*), but is distinguished by many characters from that animal, and has been set apart as the type of a peculiar family called Rhinodontidæ.

It may interest your readers to learn that the *Rhinodon* has a representative in American waters. The species referred to is a very large shark that has been found in the Gulf of California, and indicated under the name *Micristodus punctatus*. The name implies that it has exceedingly small teeth and is spotted. The teeth are peculiar in form, and have a heel like base projecting forward and points directed backward.

The list of sharks given by Mr. Morey as inhabitants of Ceylon is not correct.

THEO. GILL.

Smithsonian Inst., Washington, D. C., July 13, 1883.

Alloys.

A mass formed by the mixture of any two or more metallic bodies, in which the different constituent parts cannot be distinguished from each other by their external characters, is an alloy. In this definition no distinction is made between mere intimate mechanical mixtures and proper chemical compounds, because we are hardly possessed of sufficiently accurate experiments to ascertain which belong to the former and which to the latter class. The mixed metals into which mercury enters are called amalgams, and they possess many curious and peculiar properties; in their general characters, however, they resemble the other metallic compounds, and therefore the observations in this article are equally applicable to each.

Almost every metal that is met with in commerce contains a small variable proportion of some other metal, and therefore, strictly speaking, they are all alloys. Thus, lead contains silver; tin, arsenic; copper, iron; but after the usual processes of refining are gone through, the quantity which each metal holds of any other metal is so small that its properties are not perceptibly altered by such admixture. A metallic mass, therefore, is scarcely considered as an alloy except the characters of the prevalent metal are obviously modified; in the same manner as the oil of vitriol of the stores acts the part and bears the name of sulphuric acid, notwithstanding a minute portion of potash with which it is combined.

Alloys are prepared either by melting the ingredients separately and pouring them together when they are liquid, or by fusing them all down together in the same crucible. When the metals employed are of different degrees of fusibility, and especially when the one that is the easiest fusible is also very inflammable, the first method is had recourse to; as when copper and tin are to be combined; but the latter is practiced in those cases where the materials are either nearly of the same degree of fusibility, or at least where the temperature required for melting the least fusible is not enough to volatilize that which is the most so. In order to prevent oxidation, the crucible ought to be lined with charcoal, and a quantity of decrepitated salt should be strewed over the top of the ingredients, which, melting at a very low heat, will float on the surface of the metal, and thus exclude contact with the air. By taking these precautions a lower and longer continued heat may be advantageously substituted for a shorter and more violent one, the ingredients will be mingled more perfectly, and the loss and consequent inaccuracy when experimenting on the most inflammable metals will in a great measure be avoided. As soon as the mass is liquefied, it will be of advantage to stir it repeatedly, to prevent the ingredients from separating according to their respective specific gravities, before they have had an opportunity of combining together; for this purpose a charred stick, or rod of baked clay, is to be preferred to one of iron, as this last would in many cases be acted upon by the melted metal, and spoil the process. The alloy should also be poured alternately from one red hot crucible into another, and back again, to insure intimate mixture of the ingredients. These are by no means useless precautions, for where one of the metals is of considerably greater density than the other, it requires particular care to make the quality of the alloy equal throughout the whole of the mass. Schlutter relates that twenty pounds weight of silver, containing about a fifty-sixth part of gold, was melted in a crucible, and poured into cold water to be granulated. Samples from the top, middle, and bottom of the mass were then assayed, and were found all to differ in their proportions of gold. In like manner, Mr. Hatchett observed that gold made standard, with the usual precautions, by silver, copper, lead, antimony, etc., and then cast into vertical bars, was by no means distributed equally, but that the top of each bar (being composed of the portion of alloy which occupied the bottom of the crucible) was both purer and of greater specific gravity than the lower end of the bar.

It is a matter of considerable importance to ascertain whether alloys are mere mixtures or proper chemical compounds. In most instances there seems to be little or no doubt of the latter being the case, and perhaps all the supposed examples of the contrary may be looked upon as instances of the supersaturation of one of the ingredients by the other.

The evidence of chemical affinity between metallic substances is of the same kind as in other cases, consisting either in an entire change of properties, or in such modifications of them as are obviously not intermediate between those of the constituent parts.

The remarkable difference between the fusibility of some alloys and that of their constituent ingredients may be considered as a sign of real affinity. As far as experiments have been instituted on this subject, it appears that the point of liquefaction in almost all alloys is lower than would have been inferred from the mean fusibility of their elements. Thus, a mixture of gold and iron will melt at nearly the same temperature that is required for the fusion of gold alone. In some cases the fusibility of the alloy is even greater than that of its most fusible ingredients; thus, an alloy of tin, lead, and bismuth will become fluid in boiling water; a heat not sufficient for the melting even of bismuth, the most fusible of the three.

Some metals appear capable of uniting with each other in any proportions, as gold and copper, lead and tin, lead and silver, etc.; others are said to combine only to saturation, as silver and iron, lead and iron, etc.; of this, however, there seems to be some doubt; while a few have been reckoned absolutely incapable of combination; thus, quicksilver is supposed not to unite either with iron, cobalt, or nickel. Something, however, in these three instances is to be attributed to the hardness of the metals, and to their requiring for their fusion, or even softening, a heat much greater, that will entirely volatilize quicksilver, so that the circumstances most favorable to combination cannot in these cases be brought about. This much, however, is certain, that if iron be previously combined with tin or zinc, the mixture will dissolve in mercury without difficulty, forming in the first instance a magnetic, and in the latter an unmagnetic triple alloy.

The durability of alloys is in most cases much less than might be supposed from that of their compounds; so generally indeed does this happen, that Macquer and Gellert are inclined to deny to those metallic mixtures that are ductile the name of alloys. This, however, is clearly carrying the matter to an excess. Some very ductile materials are rendered perfectly brittle by the addition of a very minute proportion of even another ductile metal, as is strikingly the case with the alloy of lead and gold, half a grain of the former rendering an ounce of the latter extremely spongy and brittle. In many of the brittle alloys, however, a variation in the proportion of the ingredients will so greatly modify this quality, without materially affecting the others, as to render it probable that brittleness is rather a proof of supersaturation than of chemical union. Iron, when combined with about a fifth of tin, forms a white alloy, whose fusibility, specific gravity, etc., clearly demonstrate a chemical union, yet the compound is very soft and ductile; but when the proportion of tin is rendered equal with that of iron, the mass is perfectly brittle. So in like manner copper with one-sixteenth of tin forms a malleable alloy, but if the tin is increased to one-third of the whole, the alloy is brittle. Even brass, which, when made of eleven parts of copper to one of zinc, is more malleable than copper itself, becomes brittle when zinc forms one-third of the mass.

In a few cases the color of an alloy may be considered as indicative of chemical union, being by no means intermediate between that of its elements. Of this kind is the golden color of the alloy of copper and zinc, and the silver hue of arsenicated copper; but the general similarity of color between the white metals and their alloys confines the application of this external character to a very few instances.—*Glassware Reporter.*

A New Kind of Gunpowder.

Himly, in his efforts to discover a new kind of gunpowder that should possess more power than the ordinary powder, without the dangerous properties of the nitro-compounds like dynamite and that class, found that the best results were obtained with a mixture of saltpeter, chlorate of potash, and a solid hydrocarbon.

The new powder is made by mixing finely pulverized saltpeter, chlorate of potash, and coal tar pitch with enough benzol (from coal tar) to make a plastic paste or dough. This is formed into flat cakes by pressing it into moulds, and the benzol allowed to evaporate. The cakes are then granulated like any other gunpowder. Like ordinary powder, the grains are irregular and can be made of any desired size. Its specific gravity is 0·9, or a little more, agreeing with common gunpowder.

It is quite hard, and does not smut off even when damp. It will bear a heat greater than that of melting tin without change. It will not ignite by a single spark of short duration. If ignited in an open vessel, it burns rapidly with a white light. In a closed space it burns violently, and leaves behind a slight residue, producing but little smoke. A gun is not injured in the least by the products of its combustion.

The advantages of this powder over those previously in use are essentially the following

1. Ease and rapidity of manufacture.
2. There is no danger in making it.
3. Its freedom from any hygroscopic qualities; 100 grammes of it exposed to damp weather for four days in an open window showed no gain of weight with a delicate balance.
4. It is two and a half times more powerful than common powder.
5. The slight residue, leaving scarcely anything.
6. The fact that it gives off so little smoke as to be scarcely noticed, and what is formed is totally innocuous as contrasted with that from nitro-explosives.—*Repert. Analyt. Chemie.*

Improved Photo Developer.

Where the photographer intends to travel, and develop on the route, it is very desirable to reduce his chemical outfit to the smallest bulk and to the fewest liquids possible. Mr. G. Cramer, the dry plate manufacturer, gives the following formula for a developer, which he considers gives the best of results, and at the same time has the advantage of extreme portability:

Stock Solution.

Sulphite of soda (crystals)	3 ounces.
Bromide of ammonium	½ ounce.
Bromide of potassium	1¼ ounces.
Pyrogallic acid	2 ounces.
Dissolve in distilled water	32 ounces.
Add sulphuric acid (c. p.)	120 minims
Add aqua ammonia (strongest)	3 ounces.
Add water to make up bulk to	40 ounces.

The sulphuric acid and aqua ammonia should be measured very exactly. Instead of three ounces of crystals, two ounces of granular sulphite of soda may be substituted to produce the same effect. Dilute a sufficient quantity for one day's use as follows: for ordinary purposes, one part in eleven; for very short exposures, one part in three to six; for over-exposed plates, or in all cases where great intensity and contrast are desirable, one part in twenty. This developer may be used repeatedly if it is always returned immediately to the pouring bottle, which should be provided with a tight fitting rubber stopper. As long as the solution remains transparent, it is good; but when it looks muddy its use should be discontinued.—*Philad. Phot.*

The Effects of Thin Atmosphere.

Virginia City, Nevada, is a little more than 7,000 feet above sea level, yet even at that comparatively moderate altitude as compared with some other inhabited elevations the housewife finds some difficulty in cooking by boiling, the water boiling at too low a temperature to thoroughly cook meat and vegetables. The *Virginia City Enterprise* says that there is complaint every year that the peas brought from California are as hard as buckshot. The trouble is that the water does not become sufficiently hot to cook them. Here, when either meat or vegetables are being cooked by boiling, the vessel used should have a close fitting lid, in order that the steam may be confined. There is, of course, no trouble about roasting meats or anything else, fire being as hot here as in any other part of the world. While strangers complain much of the thinness of our atmosphere, old settlers are not much distressed, and children born and reared here seem not to suffer inconvenience in any way. They race up and down the sides of the mountains at full speed without finding any difficulty in breathing.

A Peculiar Worm Disease.

At a recent meeting of the Chicago Amateur Photographic Society, Prof. Bellfield showed a series of photo-micrographs, one of which, he said, represented a peculiarly interesting animalcule. It was a species of worm found in the blood—a new disease, and, so far as known, confined to the tropics, so that, as skillful medical practitioners are not very plentiful in those regions, the opportunities for studying it have been very limited. The particular case from which this photo-micrograph was made was an English soldier who had been some time in India. At the age of 25 he was sent home with his regiment, and quartered in London. Soon after arrival there he showed such peculiar symptoms that he was sent to hospital, where the speaker was then practicing. The picture before you represents a drop of blood obtained by pricking his finger. You will see it contains a great number of minute worms. The most remarkable part of the whole matter is, that these worms are present, or at least visible, only at night, from 5 or 6 P.M. to 8 or 9 A.M. They gradually increased in number from 6 P.M. to midnight, and then diminished to 8 A.M., by which time they had completely disappeared. The maximum number (about midnight) would be from 100 to 125 in a drop of blood such as could conveniently be included under the cover glass. It was very difficult to count them on account of their continual squirming, but by different persons counting, so as to check one another, we were sure there were over 100. We had this patient under our observation for about three months, and made a chart showing the variations in number of these parasites from hour to hour and from day to day. We also made a calculation of the total number probably contained in his blood at the maximum, and estimated it at about forty millions. Now, the question is, when they disappear what becomes of them? No satisfactory answer has yet been given to that question. One theory is that they are dissolved in the blood, and as they are of a very low grade or organism, there would seem to be some foundation for that theory, but it is open to the almost insuperable obstacle that no mother worm, however industrious, could possibly produce forty millions a day, and keep it up for three months or more. He might mention here that the parent worm has only been found in two cases. It inhabits the same body in which the larvæ are found, is nearly three inches long, and about the size of a hair. The disease is of such recent origin, and, as previously mentioned, confined to tropical countries, that opportunities for study have been very limited. It was first noticed in India in 1869. The likeness of this parasite to the trichina has been generally noticed—each has a distinct sheath, and each is capable of violent motion. It is, however, smaller than the latter, and is found only in the blood, while the former inhabits the muscles. It has been ascertained that the larvæ of these blood worms are sucked up by mosquitoes, develop in the body of the latter, and after the mosquito's death presumably arrive at maturity in the water, and are imbibed by human or other animals in drinking the water.

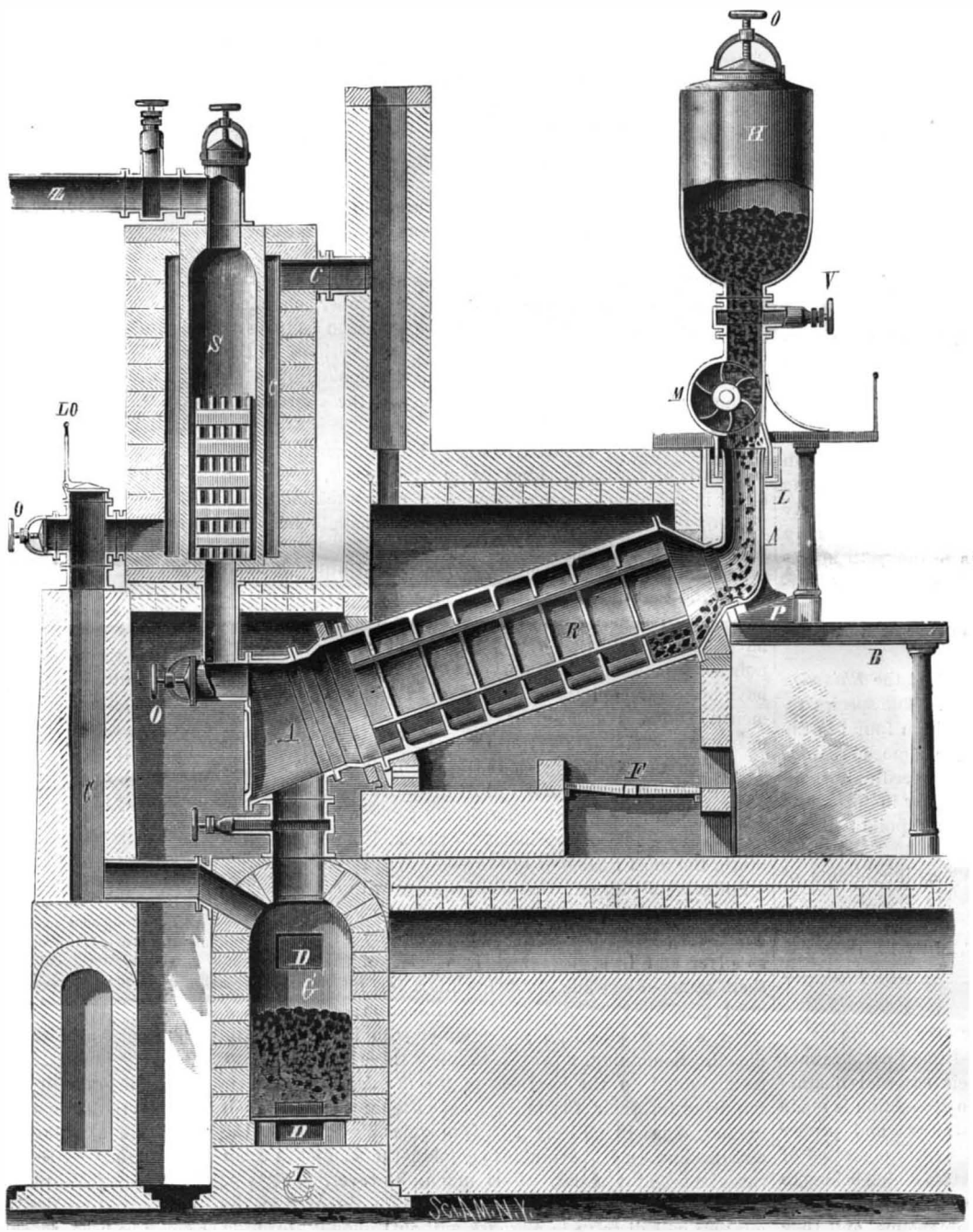
A Useful Kind of Solder.

A soft alloy which attaches itself so firmly to the surface of metals, glass, and porcelain that it can be employed to solder articles that will not bear a very high temperature can be made as follows:

Copper dust obtained by precipitation from a solution of the sulphate by means of zinc is put in a cast iron or porcelain lined mortar and mixed with strong sulphuric acid, specific gravity 1·85. From 20 to 30 or 36 parts of the copper are taken, according to the hardness desired. To the cake formed of acid and copper there is added, under constant stirring, 70 parts of mercury. When well mixed, the amalgam is carefully rinsed with warm water to remove all the acid, and then set aside to cool. In ten or twelve hours it is hard enough to scratch tin. If it is to be used now, it must be heated so hot that when worked over and brayed in an iron mortar it becomes as soft as wax. In this ductile form it can be spread out on any surface, to which it adheres when it gets cold and hard.—*Amateur Mechanics.*

IMPROVEMENT IN THE MANUFACTURE OF ILLUMINATING GAS.

Coal gas is commonly made by placing from two to four hundred pounds of bituminous, or, as it is better known, gas coal into an iron or fire clay retort heated externally. The air being excluded from the retort, the coal is coked, the gas, tar, and other products of the coal being conducted away through suitable purifying vessels, and the coke remaining in the retort being removed at regular periods ranging from three to six hours, when the retort is again freshly charged with coal. The work of discharging and recharging the retorts is done mostly by hand labor, and from the fact that the temperature of the retort house when this work is done often reaches 116° to 120°, it may be inferred that this work is extremely trying to men, even after being long used to it. To make water gas, anthracite coal contained in a suitable apparatus is heated by external fire, but more frequently brought to incandescence by direct combustion. The supply of air is then shut off, and the vessel being closed by a valve, steam is admitted. The steam passing through the heated coal is decomposed principally into hydrogen and carbonic oxide. In a further stage this otherwise non-luminous gas is enriched by hydrocarbon vapors or gas to any required degree, and passing on through the purifying apparatus, the gas is disposed of the same as gas made from coal only.



NEW APPARATUS FOR THE MANUFACTURE OF ILLUMINATING GAS.

In the accompanying engraving we illustrate in section a system for the manufacture of illuminating gas, devised by Mr. Frederic Egner, Engineer to the People's Gas Light and Coke Co., of Chicago, Ill., which seems to have novel and interesting features. By the use of this, the manufacture of coal and water gas may be united; cannel or ordinary gas coal being the principal material used, and this with the least amount of manual labor, the work being done for the most part by machinery, the action of the gases themselves, and the gravity of the material.

H is a hopper for coal, closed air tight at the top by the removable door, O. Several of this kind of doors are placed in desirable positions about the apparatus. V are valves to be used as occasion may require. R is a cast-iron retort, cylindrical in form, divided internally into a number of compartments by annular lips or flanges and longitudinal ribs or partition pieces. The retort rests at both ends on half pillow blocks, and is closed at the ends and still further supported by one stationary and one movable mouthpiece. The movable mouthpiece, A, at the upper end rests on the inclined slide, P, thus allowing expansion of the retort. Between the hopper, H, and movable mouthpiece, A, the joint is effected by the water lute, L; P and H being supported independently by beams, B, and suitable pillars. G is a water gas generator or the coke chamber, provided with doors, DD, and a blast pipe at X, and steam connections. C are hot air chambers or flues for the passage of the gases of combustion. S is the superheater or fixer for the gas. Z is the pipe through which the good gas passes to the purifying apparatus.

The process of gas making by this system is as follows: The hopper being filled with coal, the air tight cover closed, and the retort brought to a dull red heat, say about 980°, near which it is to be kept throughout the process, the retort is caused to be slowly revolved by means of a cog wheel keyed upon the lower end of the same, which is engaged by a pinion upon a shaft, not shown in the cut, which imparts motion to the whole. As the retort slowly turns over the fire on the grate, F, the coal will drop from the upper chamber into the next below, and so on, until the coal, deprived of the richest and largest part of the gas, drops into the coke chamber. As the upper chamber of the retort is emptied, the measuring drum, M, delivers a fresh charge of coal from the hopper into the retort. At the temperature mentioned, the results of a ton of coal would be about 6,000 cubic feet of rich gas, and a large amount of tar and other vapors. These vapors in the ordinary processes are, almost immediately after leaving the retort, condensed in the hydraulic main, where they must pass through a lute composed of tar and water in escaping from the retort. But in this process the tar still in the shape of vapor—to which condition it cannot be brought again by ordinary means after being once condensed—is brought into the superheater, S, a retort heated externally and filled with loose brick laid in a checker form as shown, and then the tar vapors are for the most part converted into rich gas. And in this way alone it is believed that the product of gas per ton of coal would exceed any results previously worked by the old processes. The gas, too, will be exceedingly rich.

The coke while still in a red hot state, is treated with a current of superheated steam, and until quenched will decompose the steam, and thus not only considerably swell the volume of gas made, but this volume being non-luminous, it will in a simple and economical manner reduce or dilute the otherwise too rich gas made in the first operation. The quenched coke may then be removed. But if it is not desired to save the coke, the process for making water gas in addition to coal gas, and in combination with the same—aided with a little oil—can be fully carried out, and all the coal placed in the retort be thus converted into gas, excepting naturally that part of the coal—the slag or clinker—which must be removed the usual way through the lower door of the generator, G.

It has been found in practice that iron retorts, when not heated above the temperature herein stated, have, after fifteen months' use, been practically as good as new. Fire clay retorts have been substituted for iron, because by enabling the coal to be subjected to a greater heat a larger yield per ton was obtained. But here we convert the gaseous products of the coal into fixed gas and condensable vapors in the iron retort without injury to the latter, and then send these products into a fire clay retort heated to any required degree, and then complete the operation. By comparing this with older processes, it must be admitted that the system is worth a fair trial at least.

Further particulars may be obtained by applying to the inventor, Frederic Egner, care of People's Gas Light and Coke Company, 39 and 41 So. Halsted St., Chicago, Ill.

DR. H. WINNACKER (*Naturforscher*) has made a particular study of the vegetation of sewers and of drainage channels. He finds that the algæ which are harmless flourish best in channels which are constantly traversed by clean water. On the other hand, the Schizomycetes (including *Micrococcus*, *Bacillus*, *Spirillum*, and *Bacterium*) which are dangerous flourish in water courses which are alternately wet and dry. A green deposit is a favorable sign.

Crystoleum Painting.

Photographs and other pictures may be colored from the back as follows:

Take a smooth piece of glass rather larger than the print to be colored, and, after having cleaned it thoroughly, dust it over with powdered French chalk; rub it well into the glass, and then wipe it off with a piece of clean linen.

Next coat the plate with plain collodion, and allow to set, but not dry, otherwise the film will probably leave the glass. When the collodion is set, it in turn receives a coating of gelatine solution—one part by weight of gelatine to eight parts of water. This is then placed on a level surface, care having been taken that the gelatine solution has flowed well to the edges of the plate. It must then be left to dry. The print should also receive a coating of gelatine similar to that on the plate. This is best done with a soft brush or a piece of clean sponge, by which means there will be no danger from air bubbles. The picture must then be dried. Next wet the film on the glass plate by passing a wet sponge over the surface; and at the same time wet the print by immersing it in cold water for a few seconds. Now lay the print face downward on the glass plate, bringing them in contact by means of a squeegee or roller, taking care, while doing so, not to disturb their position, as it may wrinkle the film beneath. It must then be allowed to dry. Next rub the paper away from the back of the print with fine glass paper, working gently in a circular direction, the object being to get it as thin as possible. Care, however, must be taken not to rub away all the paper.

The next operation is to render the print transparent. There are several substances for rendering the print transparent, but I have found ordinary paraffine wax melted at low temperature answer as well as anything. Place the print in this, keeping it in a molten condition, and when transparent the picture should be removed. If the temperature be raised too high, it is liable to turn the print yellow.

When cold wipe off all excess, and then proceed with the painting. This only requires a little ordinary care. It is best to begin with the eyes and lips, and all small places which require different colors to the main color. When these are dry, the color of the flesh and dress may be laid on with a large brush. When the paint is thoroughly dry, a sharp knife is passed round its margin. The print is then raised from the glass, which it leaves freely, and a delicately painted photograph is the result. It may then be mounted on card in the ordinary way. This process seems to lend itself to oil paints; but if the operator wish to employ water colors he must use some medium, such as shellac dissolved in borax, for mixing the colors.—*E. E. Cadett, in Br. Jour. of Photography.*

Nitrogen Selenide.

Verneuil has recently sent to the *Bulletin Soc. Chimie* a report of his experiments on the preparation of the selenide of nitrogen which was discovered by the late Professor Wohler in 1859. The Gottingen professor prepared it by saturating selenium perchloride with ammonia gas; but Verneuil finds that the method more recently proposed by Fordos and Gelis for the preparation of nitrogen sulphite yields better results, and he takes 10 grammes of the perchloride and mixes it into a paste with a few drops of carbon disulphide, and the paste is then suspended in a liter of carbon disulphide, in which it is almost insoluble. Into this liquid a current of dry ammonia gas is passed. Flocks of ammonium chloride are precipitated, and the liquid passes from a rose tint to a dark cochineal red color. Finally, the red color disappears and brown flocks are thrown down. The current of gas is continued until the flocks become of a clear orange tint. The liquid is filtered, and the flocks washed with carbon disulphide and dried. On removing the ammonium chloride with water, washing again with carbon disulphide, and drying, the nitrogen selenide is obtained pure in amount equal to 80 per cent of the theoretical yield. It forms an amorphous powder, insoluble in all solvents, having the formula Se_2N_2. When dry it detonates instantly by a shock, being as easily exploded as mercury fulminate, less easily than nitrogen iodide. Potassium hydrate and hydrogen chloride decompose it, producing selenite of potassium and ammonia.

Laying Turf in Summer.

Mr. Henderson says: "I find that turf can be successfully laid down, if necessary, in dry and hot summer weather, by simply covering it when finished, before it gets too dry, with about a quarter of an inch of light soil put through a half inch sieve. The grass begins to grow through the soil in a very few days."

THE ARGUS PHEASANT.

In the year 1780, the first skin of a magnificent bird, called the Argus pheasant, was sent to Europe. It excited universal admiration. A little later, in 1785, Marsden gave the following account of its manner of living:

"The famous Argus pheasant, or 'kuau,' is a bird of unusual beauty, perhaps the most beautiful of all birds. It is a very difficult matter, after it has been captured, to keep it alive for any length of time. It hates the light. When it is in a dark place it appears quite lively, and its voice may perhaps be heard. Its tones are more pitiful but not quite so shrill and clear as the peacock. In bright sunlight it sits motionless. Its flesh tastes exactly like the flesh of other pheasants."

Raffles says: "This bird, which plays an important part in Malayan poetry, lives in the deepest wilds of Sumatra, and is commonly found by pairs. Solomon Müller asserts that he heard the strong voice of this bird for the first time, when near Southern Borneo, sixty meters over the sea. The young, as with the peacock, obtain their beautiful plumage after repeated moulting."

The natives catch these birds in snares, because it is not only remarkably shy and cunning, but it conceals itself in the thick undergrowth of the forests, so as to escape even the sharp eyes of the natives. An old Malay, whom Wallace challenged to shoot one of these birds, whose voice was continually heard in the forests of Malacca, asserted that during twenty years of his life as a hunter he had never killed one of these pheasants, or even seen one in the open forests. From Padang, on the western coast of Sumatra, Rosenberg writes: "The natives often bring me living birds, receiving from one and a half to two guldens in payment for each one. They are also numerous in the mountain forests of this island. In the midst of the deepest wilds the traveler or hunter sometimes comes upon a bare place, cleared carefully of branches and leaves, from which paths run into the forest in all directions. Here, sometimes at midday, the Argus pheasant may be found resting, playing, or fighting; they may be seen like hens lying on the ground, which is warmed through by the sun's says, and 'bathing' themselves in the sand. The hunters place their snares in these paths. The hen lays from seven to ten white eggs, a little smaller than goose eggs. The nest is concealed in the thickest undergrowth. In freedom the bird subsists on insects, snails, worms, leaf buds, and seeds of various kinds. The flesh is very palatable."

Until recent times, Marsden's opinion that these birds could not endure captivity was thought to be true. But now the Argus pheasant may be found in several zoological gardens. It is really incorrect to call this bird a pheasant, for, as Rosenberg asserts, in gait, behavior, and disposition it is a peacock; possesses its loud voice, and even its expression of countenance.

When sitting it holds itself in an almost horizontal position, carries itself in a lazy manner. It walks with long strides, and nods its head with every step. Its head is drawn in between its shoulders, and is only thrown forward in walking; it runs dexterously along the branches; springs without help from its wings over long distances; is not a good flier.

The Argus pheasant (Argus giganteus) differs from all known birds in the extraordinary development of the secondary feathers of the wings. "While walking or sitting on a bough this is not so noticeable, but when the bird spreads its wings they come out in all their beauty. When the bird chooses, it can raise the tail so that it stands in the air between the wings, and is partially spread."

The bill is elongated and slightly curved at the point; the foot is long, but has no spurs. The eye is naked; the head and back of the neck are covered with short feathers. The short crown feathers are a velvety black. The hair-like feathers of the back part of the head are yellow striped with black. The feathers on the neck are a warm chestnut brown, striped with light yellow. The middle of the back is a yellowish gray ground, marked with round dark brown spots. The longest tail feathers are black, with white spots surrounded with a black ring.

The secondaries of the wings are wonderful examples of plumage; they have a beautiful dark reddish brown ground color, with bright reddish gray stripes, and are covered with rows of spots, surrounded by a dark ring. Wood says that in one feather in his possession there were seventeen large "eyes" on the outer web, each being surrounded by a ring of jetty black, then with a dash of chocolate within the ring, then olive with a tinge of purple, lastly a spot of pure white near the tip, fading imperceptibly into the olive on one side and the chocolate on the other; between these spots are some leopard-like mottlings. The inner web is pale fawn, covered with black spots surrounded with buff, and the tip of the whole feather is deep brown, spotted profusely with white.

The ring around the eye is reddish brown, the bill ivory white, the eye bright ash-blue, the foot bright carmine.

The total length of the bird is more than five feet, the plumage is so developed.

The hen is much smaller and plainer in form and the marking of the plumage. —*From Brehm's Animal Life.*

THE ARGUS PHEASANT.

A Diffusion Engine.

A curiosity in physics was exhibited by Mr. Woodward, lately, at the Physical Society, London, in the shape of what is veritably a diffusion engine, that is to say, a machine in which work is done by the diffusion of gases. The action of the engine is based on an experiment of the late Professor Graham, the well known chemist. This experiment consists in taking a red clay porous cylinder containing air, and covering it with an inverted bell jar full of hydrogen. The hydrogen diffuses into the cylinder more quickly than the air diffuses out, as is shown by means of a glass tube projecting from the bottom of the cylinder into a vessel of colored water. When the gaseous pressure inside the cylinder is increased by the influx of hydrogen, the mixed gases descend this tube and bubble out of the water. On removing the bell jar, the action ceases and a reaction, due to fall of pressure, causes the water to rise in the tube. By suspending the gaseous cylinder of porous clay from a balance beam, and directing a jet of hydrogen gas against its side, the beam begins to oscillate and keeps plainly oscillating for a length of time; the action being sustained, as Professor W. G. Adams, F.R.S., pointed out, by the alternations of gaseous pressure in the cylinder.

Copper and Lead in Food.

A. Gautier shows that copper is little calculated to produce mortal results. The solubility of most of its salts, their marked color, nauseating taste, and emetic action give at once warning. The salts of lead, on the contrary, have no pronounced taste, or are even sweetish. They are in general colorless. If introduced into the system, there is no alarming effect until the nervous centers, the liver, and the blood have become interpenetrated with the poison. All foods sold in tins, especially if of a fatty nature, public water supplies, wines, beers, effervescing drinks, the glaze of earthenware, enamels, and especially culinary utensils lined with tin, may introduce lead into the system.

Recent Progress in the Manufacture of Soap and Candles.

BY G. HARTL, OF VIENNA.

There have been no recent improvements in the manufacture of stearine candles beyond perfecting the saponification with sulphuric acid, and obtaining good results on a large scale without distilling. The candles are no better than they were, except that they are harder, and there is a certain disadvantage in this, for unless they are carefully lighted the stearic acid will run off in places, forming points and dents that surround and injure the light. The artificial butter and oleomargarine manufacture has withdrawn the more easily fusible compounds from the market, leaving the solid stearine for candle making. This has necessarily raised the melting point of the pure stearic acid, hence the candles unavoidably run off, because a part of the small flame formed by the burning wick is unable to draw up the melted stearic acid. It is therefore necessary to hold the candle horizontally while lighting it, and turn it slowly around until the stearic acid is partially melted, to avoid the evil just mentioned.

Many candle manufacturers add paraffine to prevent this, as it renders the candle more fusible, but if there are many candles burning in one room they produce a disagreeable odor, that is particularly unpleasant when they are extinguished.

Saponification with sulphuric acid was discovered by the French chemist Fremy, a short time after the discovery of stearic acid, and was made use of in the distillation of the fatty acids. As much as 37 per cent of concentrated sulphuric acid was employed to separate the fatty acids in the fat, and of course as a result enormous quantities of the fatty acids were destroyed and converted into tar; 100 lb. of tallow would yield 83 or 84 lb. of fatty acids, while the same quantity of palm oil produced 80 to 81 lb. Sulphuric acid saponification combined with distillation is now in use in most countries.

The most important step taken in advance by soap makers is that they are beginning in various places to utilize the glycerine which has always been permitted to run off with the waste lyes. The separation of the glycerine from soap boilers' lyes will always involve considerable difficulty, for the various salts in the lye will give rise to unpleasant complications in purifying the glycerine. For this reason it is more profitable to separate the glycerine from the fats and oils before using them for soap.

There have also been very great improvements in trying out tallow and suet, and it may be said that this operation has now reached the highest degree of perfection. The intelligent soap boiler can try out the tallow that comes to his shop in such a manner that the neighborhood does not suffer the slightly inconvenience; no unpleasant odors are produced, for they can be melted at 130° to 140° Fahr. For this we are indebted to a newly invented chopping device, as that alone makes it possible to melt out the raw tallow at a low temperature. The French chopping machines are very good, but those made by Von Lohr are still better, for they grind up the tallow to a kind of magma, so that all the fat comes out at 130° or 140°. Any residue left is melted by steam in closed vessels, or it can be converted into soap by boiling with lye.

In the stearine candle factories the slightest residues can be melted with the otherwise useless dilute sulphuric acid. This new method of trying tallow, as already mentioned, is the acme of perfection. The melted tallow is very nice and tasteless, so that it can be used for food after being rendered odorless, as well as tasteless, by proper treatment.

The machines made now require a four-horse power engine to run them; it would be very desirable to make such machines as could be used in small establishments that are unable to put in a steam engine.—*Translated from the Neueste Erfindungen.*

Freight Train Speed.

In experiments made with a heavy freight train on a Western road several years ago by Mr. P. H. Dudley with his dynograph car, it was found that a speed of 18 miles an hour required less power and was more economical of fuel than a slower rate of speed, say 10 or 12 miles an hour. This was the result for the entire trip, including all the elements of resistance, frictional, atmospheric, grades, curves, etc. The track was in good condition and was laid with steel rails. The reduction in the amount of fuel consumed was very marked, owing to the fact that the engine developed its power at the higher speed much more economically than at a slower rate. It was also evident that journal and flange friction, within the limits of freight train speed, decreased with the speed, and that with proper curve elevation the resistance of such trains decreases in most cases as the speed increases. It was found, however, that when trains were run at a rate much above 18 miles an hour, the atmospheric or wind resistance increased faster than the other elements of resistance decreased. These results, it is to be presumed, were realized upon tracks with moderate grades and curves. Upon long and heavy grades, in connection with sharp and frequent curves, the conditions would, of course, be very greatly changed.

Without going into an analysis of the various mechanical causes which combine to impede the movement of trains—an exceedingly difficult thing to do with any degree of precision—the fact seems to have been established by Mr. Dudley that an average speed of 18 miles an hour for heavy freight trains, upon roads as straight and level as the New York Central and its immediate Western connections, is more economical as respects consumption of fuel and tax upon motive power than a slower speed. But whether this limit can be exceeded with like results is not so clear. There seems to be a point at which the atmospheric resistance is increased to such an extent as to neutralize the decrease of frictional resistance due to increased speed. If this point could be definitely ascertained as respects freight trains, it would go far toward settling the question as to whether these trains can be run to advantage at a speed of 25 or even 30 miles an hour. The old theory that train resistance increases as the square of the speed has been a good deal shattered by recent experiments with the dynograph. In regard to passenger trains, Mr. Dudley found, if our memory is not at fault, that the draught of a certain train at starting was 12,000 pounds, while at a speed of fifty miles an hour it was only 3,000 pounds. And yet, if reliance is to be placed on some other authorities, the atmospheric resistance to passenger trains moving at high speeds increases in a ratio much greater than the square of the velocity, however it may be with journal and flange friction, curves, and grades. That the maximum speed of passenger trains has not increased within the past thirty years, notwithstanding the efforts that have been made in the way of fast running, is an evidence that with them the practical limit has been reached, under existing conditions at all events.

It is highly desirable, however, that freight trains should move faster, so that a larger annual tonnage can be transported in a given number of cars. That they ought to move faster, with improved locomotives, steel rails, and better ballasted tracks, seems obvious. That their speed will be increased in the future about in proportion as grades are reduced and curves straightened on all our roads, there can be no doubt; but whether the average rate of speed will be 18 or a much greater number of miles per hour, cannot at present be determined.—*Car-Builder.*

A Balloon for Service under the Sea.

According to the London *Daily News*, the International Exhibition of Nice is reserving some wonders for the foreigners who may propose to pass a portion of the winter of 1883–84 upon the borders of the Mediterranean. One of these wonders is a balloon which its inventor, M. Toselli, calls "the observatory under the sea." It is made of steel and bronze, to enable it to resist the pressure which the water produces at a depth of 120 meters. This "observatory under the sea" has a height of 8 meters, and is divided into three compartments. The upper apartment is reserved for the commander, to enable him to direct and to watch the working of the observatory, and to give to the passengers the explanations necessary as to the depth of the descent, and what they will see in the depths of the sea. The second apartment, in the center of the machine, is comfortably furnished for passengers to the number of eight, who are placed so that they can see a long distance from the machine.

They have under their feet a glass which enables them to examine at their ease the bottom of the sea, with its fishes, its plants, and its rocks. The obscurity being almost complete at 70 meters of depth, the observatory will be provided with a powerful electric sun, which sheds light to a great distance in lighting these depths. The passengers have at their disposal a telephone, which allows them to converse with their friends who have stopped on the steamboat which transports the voyagers to such places as are known as the most curious in the neighborhood. They have also handy a telegraph machine. Beneath the passengers an apartment is reserved for the machine, which is constructed on natural principles, that is to say, as the *vessie* of a fish, becoming heavier or lighter at command, so as to enable the machine to sink or rise at the wish of the operator.

Improved Mode of Charging the Holtz Electrical Machine.

To secure the efficient working of a Holtz induction machine, Mr. Karl Antolik recommends keeping the revolving disk as close as possible between the fixed disk and the metal points of the collecting combs, and particularly that the fixed disk should be kept warmer by at least 10 deg. Centigrade than the surrounding air. The machine should, however, not be placed in front of a fire, or otherwise heated direct, as then cracks begin to form in the shellac; but it ought to be effected by dark rays only.

For this purpose Mr. Antolik constructed a special lamp, consisting of a flat circular copper vessel, 7 inches in diameter, with its outer surface rough, and covered with lampblack. The hot air supplied by a Bunsen burner enters at the back of the vessel, which, in a vertical position, is brought to within a foot of one of the paper armatures. When this armature has become warm, the lamp is removed to the other armature, and may, during the experiment, be brought near them alternately, unless two lamps are employed.

The revolving disk should not be varnished, as the well-known metallic and conducting rings which form on the disk opposite the points of the combs are difficult to remove. These rings will, of course, settle on unvarnished glass as well, but may then easily be rubbed off with a little tallow. Mr. Antolik says that with this preparation it is only necessary gently to rub one of the warm armatures with a piece of felt to start the machine even in an unfavorable atmosphere, and it will then continue to work without any disturbing change of polarity.

Beer, Wine, and Liquor.

In a recent publication—"The Brewer, Distiller, and Wine Manufacturer"—Prof. Gardner gives some interesting facts regarding artificial drinks. Although he writes from an English point of view, it is not unlikely that his statements will have an adaptation otherwheres. Of beer, he says that until recently malt, hops, and water were the only ingredients that entered into the composition of beer, but sugar and raw grain are also now used largely in place of malt, and occasionally other bitter flavoring materials are substituted for hops. The present proper definition of beer may be as follows: "A saccharine fluid flavored with hops, or other aromatic bitters, which has been rendered alcoholic by fermentation." Aloes is now largely used to take the place of hops. It may leave the beer a lighter and more amber-like color, but it is a very inferior substitute for hops. Its presence is readily detected by the taste.

The water used in the brewing of beer is known to have a marked influence on its quality. Any organic contamination in the water spoils the product. Hard water is preferred to soft water; the sulphates and salts of calcium and magnesium in the water tending to self-fining of the beer. The ales of Burton, England, get much of their celebrity from the water used in their brewing, which comes from wells sunk in the beds of red sandstone and gypsum that abound in the neighborhood, and not from the river Trent, as popularly supposed.

Wines derive their distinctive peculiarities less from the original stock of the grape and from method of manufacture than from the climate and soil where the vines are grown. Wines so opposite in character as those of Burgundy, the Cape, and Spain are all made from the same stock of Burgundian grapes. To prevent viscidity or ropiness in wines while fermenting, grape stalks are added to the must, or tannic acid, oak bark, gall nuts, wood shavings, gypsum, or alum. When wine becomes bitter, isinglass, carbonate of lime, or slaked lime is added. To prevent acetous fermentation the wine must be fortified by alcohol.

The best whisky is made from malt. Inferior qualities are made from raw grain spirit prepared from barley, oats, rye, or rice, and the peculiar flavor admired by habitual users comes from the artificial addition of fusel oil, which is a narcotic poison.

The best brandy is distilled from white wines, but it loses strength with age, and with its strength goes its peculiar aroma. A sugar sirup with essence of cayenne and burnt sugar are used sometimes to "improve" weak brandy. Malt brandy is a spirit made from malt, potatoes, beets, or carrots.

Gin is ordinary grain spirit flavored with oil of juniper, juniper berries, oil of turpentine, creosote, lemons, cardamoms, garlic, horseradish, caustic potash, or sulphate of zinc.

Absinthe is an extract of wormwood mixed with sulphuric acid and colored with spinach.

Health Alphabet.

The Ladies' Sanitary Association, of London, gives the following simple rules for keeping health, which we find copied in the *Sanitarian*:

A—s soon as you are up shake blanket and sheet;
B—etter be without shoes than sit with wet feet;
C—hildren, if healthy, are active, not still;
D—amp beds and damp clothes will both make you ill;
E—at slowly and always chew your food well;
F—reshen the air in the house where you dwell;
G—arments must never be made too tight;
H—omes should be healthy, airy, and light;
I—f you wish to be well, as you do I've no doubt,
J—ust open the windows before you go out;
K—eep the rooms always tidy and clean;
L—et dust on the furniture never be seen;
M—uch illness is caused by the want of pure air,
N—ow, to open the windows be ever your care;
O—ld rags and old rubbish should never be kept;
P—eople should see that their floors are well swept;
Q—uick movements in children are healthy and right;
R—emember the young cannot thrive without light;
S—ee that the cistern is clean to the brim;
T—ake care that your dress is all tidy and trim;
U—se your nose to find if there be a bad drain;
V—ery sad are the fevers that come in its train;
W—alk as much as you can without feeling fatigue;
X—erxes could walk full many a league.
Y—our health is your wealth, which your wisdom must keep;
Z—eal will help a good cause, and the good you will reap.

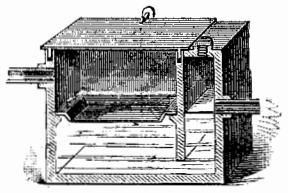
Gigantic Fossil Remains.

Workmen in a gravel pit near Syracuse, N. Y., unearthed on July 17 a tusk and tooth of what is believed to have been a mammoth. The relics were discovered at a depth of about thirteen feet from the surface. They were examined by Professor Brown, of Syracuse University, and Professor John F. Boynton, of Syracuse, both well-known scientists, and pronounced a great discovery. By calculation from the parts already discovered, Professor Brown regards it as the largest mammoth ever exhumed in this country. The tooth is twelve inches in length and weighs about twenty-five pounds. The surface of the tooth is divided into wedge-shaped transverse ridges, the summit of each of which constitute smaller cones. The enamel of the specimen is polished and perfectly preserved. The portion of tusk found is about five feet long and weighs 150 pounds. The entire tusk was probably ten or eleven feet long, and the animal when living is supposed to have stood at least fourteen feet high.

RECENT INVENTIONS.

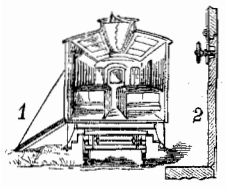
Improved Grease Trap.

The object of this invention is to prevent greasy substances from passing into waste pipes from sinks and basins, so as to prevent obstructions of the waste pipe, and also to save such greasy and fatty matters, which otherwise would be wasted. The body of the trap is made in the form of a box, having an inlet at one end and an outlet at the other. The box is divided at one side by a vertical partition, forming a small compartment which is closed at the top, and communicates with the main part of the box by a slit or space at the bottom of the partition. The main part of the box is provided with a removable cover, having an under rim which enters a groove around the upper edge of the box. This groove contains water, so as to form an air tight seal around the edge of the cover, and in addition thereto rubber packing is placed in the bottom of the groove, so that the rim can be forced down tightly by means of wedges, inserted through staples at the sides of the box. The cover of the smaller compartment is provided with a screw plug, which gives access for cleaning, and a hole is provided for allowing the inlet of air for the purpose of ventilating the trap, and also to prevent siphoning. In the larger compartment of the trap is a pan placed in any desired manner at a level with the exit pipe. This pan or plate extends from side to side of the box in either direction, but is made narrower than the box at its other sides, so as to give space for the water to pass at the sides of the pan. In operation the water passing in the inlet pipe first falls upon the pan, leaves therein matter of the same or nearly the same specific gravity, and then escapes at the sides of the pan, leaving the grease on the surface of the water. This invention has been patented by Mr. Silas Wilcox, of Portland, Oregon.



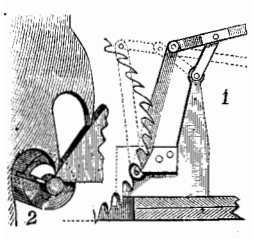
Improvement in Railway Cars.

The object of this invention is to provide a means for escape from a railway car other than the usual end doors. In the event of a collision between trains, the telescoping of the cars and the abutting timbers at the ends of the cars usually obstruct the exit by the end doors; and in the case of fire the occupants frequently perish for want of some other ready means of egress. This improvement consists in combining with one or more side doors peculiar means for holding them normally closed and fastened, and for facilitating escape by the doors if the cars should be standing on a bridge or on a declivity. The door is hinged at the bottom and arranged to drop outwardly, the door acting as a gang plank. This invention presents the advantage of great simplicity, so that any person without previous instruction can operate it, and still the fastening is such as to provide ample security against accidental opening, and also prevents all looseness and chattering. Fig. 1 is an end view of the car with the door open, and Fig. 2 is a sectional view of the door. This invention has been patented by Mr. Joseph Parkinson, of Danville, Va.



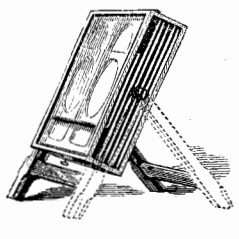
New Saw Tooth Swage.

This improvement consists of swaging dies contrived to swage the points of saw teeth from the inside outward, to widen and sharpen them. By this method the material of the saw plate will not be wasted as fast as otherwise. The teeth have better pitch, and the tendency of the device is to gauge the points of the teeth of a circular saw to a true circle. The die is moved by a system of levers toward the anvil, acting on the inner surface of the tooth, forcing it outward toward the periphery of the saw. The die is provided with a T-head and is held in a suitable recess in the roll, as shown in Fig. 2. This invention has been patented by Mr. Nathan L. Gano, of King's Ferry, Fla.



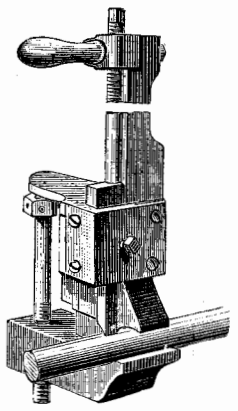
Novel Picture Exhibitor.

We give an engraving of an improved picture exhibitor, recently patented by Mr. Morris Schleissner, of 314 Canal Street, New York city. In this device the picture holding cards are arranged in a rotatable case provided with shifting partitions for supporting the upper tiers of cards, and to cause the transferrence of the cards from one tier to the other. This is effected by simply turning the exhibitor over endwise, the pictures automatically shifting their position so as to show a different pair at each half revolution of the exhibitor. This simple device not only affords a very ready means of showing the pictures, but it protects them from handling and from dust and dirt,



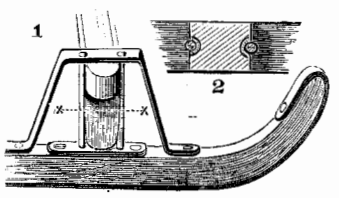
Bar and Pipe Cutter.

The engraving shows a simple and effective tool for cutting metal bars or pipes, the cutter being made so that, as it is revolved around the bar or pipe on which it is placed, it will feed the cutting tool forward automatically, so that it will take the required chip at each revolution. The jaws are clamped loosely on the pipe, the latter being held fast in a vise. The cutting tool is moved forward by a screw provided at its outer end with a worm wheel which is engaged by a worm carried by the handle, so that when the handle is grasped and not allowed to turn in the hand, the cutting tool is moved forward continuously as the cutter is turned. This invention has been patented by Mr. Charles W. Lane. Further information may be obtained by addressing Mr. F. P. Lane, 255 Hennepin Avenue, Minneapolis, Minn.



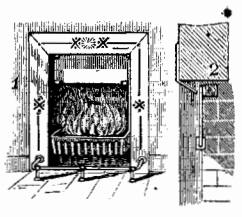
Improved Sleigh.

This invention relates to an improved beam and knee connection with the runner for securing greater flexibility on uneven roads. The knees and beam are framed together in the usual manner, but instead of framing the knees into the runner, they are arranged to rest upon the surface of the runner at the end, making the end a little convex, as shown; and to secure the beam to the runner metal knee bolts and stay bars are employed, the bolts and the bars being rigidly attached together, the bolts also being attached to the plate bolted to the runner, and the stay bars bolted to the runner at opposite ends of the plate. The beams and the knees are grooved for the vertical bolts, the grooves being lined with metal. These linings are fitted snugly to the bolts along the middle, but they are slack at the ends and along therefrom toward the middle, sufficiently to allow the beams and the runners to rock the one upon the other, thus providing for the flexibility of the joints by a substantial arrangement not liable to wear out or break. This invention has been patented by Mr. Clemens Mette, of Hancock, Mich.



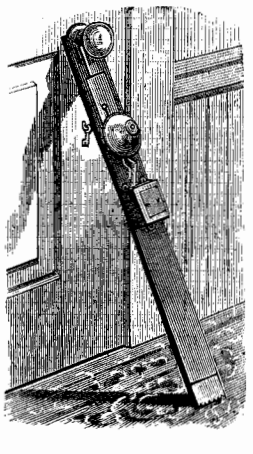
Transparent Blower for Fireplace.

This blower is made of glass or some transparent material placed in a suitable frame. The blower rests against the rear surface of the side posts of the mantel, and is held across the upper part of the fireplace opening, while its lower edge is sustained in hook clips fastened to the wall or the uprights of the mantel, and its upper edge in a stud or clip, fastened in the fireplace wall. By these means the blower is always held to the fireplace loosely, so that it can readily contract and expand without danger of fracture. Fig. 1 is a front view of the fireplace. Fig. 2 is a sectional view. With a blower of this kind the fire is visible, and the room will always be lighted by the fire, whether the blower is in use or not. This invention has been patented by Mr. John W. Edmonds, of 894 Sixth Avenue, New York city.



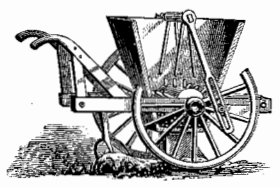
Burglar Alarm and Door Securer.

This is a simple and convenient device for fastening doors securely, and for giving an alarm should an attempt be made to open the doors. This combined door stop and burglar alarm consists of a bar recessed at its upper end to receive the shank of a door knob, and provided with a groove to receive a sliding bar having a push rod connected with its lower end, to disengage a hook connected by an elbow lever with a spring and a bell hammer, and allow the spring to swing the hammer against the bell and sound an alarm, whenever the door is opened. This ingenious and effective apparatus has been patented by Messrs. H. M. Moore and C. E. Moore, of 56 East 110th Street, New York city.



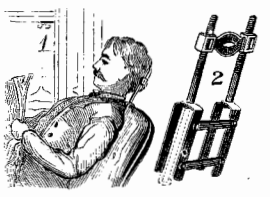
New Cotton Planter.

In this cotton seed planter the arrangement of parts of the machine is such as to particularly adapt it to the planting of unrubbed seed, and to plant the seed at varying distances apart, as desired, the parts being so disposed with relation to each other as to secure positive movements of the feed wheel and agitator. This machine, by reason of its effectiveness in planting unrubbed seed, makes a large saving in use over the planting of seed by machines which first require the seed to be hand rubbed, and the connections for driving the feed wheel and agitator are of a character to secure their positive action without slip, insuring uniformly distanced planting of the seed without waste. This planter is provided with a feed wheel having radial pins, and with an agitator consisting of whip sticks projecting downward from a shaft at the top of the hopper, and vibrated by a crank on the drive wheel and a slotted arm. Mr. Thomas N. Seay, of Eastover, S. C., is the patentee of this planter.



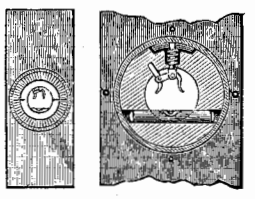
Portable Head Rest.

The engraving shows an improved portable head rest, recently patented by Mr. George Popplewell, of Bristol, Pa. It is designed principally for use on the chairs of railway cars, and is adjustable to different heights to suit different users. It may be folded and packed in a small compass, so that it may be readily carried by the traveler. It consists of two U-shaped pieces to fit over the back of the car seat, each piece being provided with a threaded rod for holding the pad against which the head rests, and each piece has a pivoted bar having a slot in its free end, to engage a screw projecting from the other. The pad is supported by two small rectangular frames, which slip over the threaded rods, and inclose the nuts by which the head rest is adjusted. Fig. 1 shows the head rest in use. Fig. 2 shows it detached from the car seat.



Improved Spirit Level.

This invention comprises an index and spirit level carrier capable of circular adjustment within a suitable holder and concentrically to a graduated dial connected with the holder, and a device for locking or setting the rotating index and spirit level carrier in any desired position relatively to the dial. Duplicate instruments of this description may be applied, one to either leg or arm of an adjustable bevel, for indicating angular surfaces; or the instrument may be combined with a square, rule, or compass, or be used as a mere level, grade, and plumb. Fig. 1 is a face view of the level, and Fig. 2 is a sectional view showing the lock. This invention has been patented by Mr. Samuel H. Lemon, of 172 East 62d Street, New York city.



Railway Weather Signals.

Along the line of the Cleveland, Akron & Columbus road in Ohio, the passenger trains are peaceful messengers, telling the farmers the condition of the temperature and of the coming storms.

The system is as follows: Signals of two colors, with three figures in each color, are attached to the sides of the baggage cars; the colors are red and blue; the figures are the sun, moon, and the star; the red colored signals tell of the temperature, while the blue colored ones tell of the state of the weather. In red the sun indicates higher temperature, moon lower, and the star stationary temperature. In blue, the sun indicates general rain or snow, moon clear or fair weather, and the star local rain or snow. For this special service predictions are received daily from the U. S. Weather Bureau at Washington. By "higher" or "lower" temperature is meant that the temperature at any hour of the day may be expected to be higher or lower than it was at the same hour the previous day; and by "stationary" temperature, that it will not vary more than three or four degrees from the record of the day before. "Local" rains are such that are likely to occur at one or more points along the line, but will not probably be "general." Trains going out in the morning are notified by the meteorological department what kind of a signal to display, and if necessary, they can be changed on the road in accordance with telegraphic instructions. This signal service is established by the joint efforts of the Ohio Meteorological Bureau and the officers of the road. From Mr. T. C. Mendenhall, the director, we learn the system is a success.—*Railroad Herald.*

BARON ROTHSCHILD'S carriage at Vienna is lighted by electric light. The apparatus is beneath the coachman's seat, and the light, which will burn one hundred hours, within ordinary carriage lamps.

ENGINEERING INVENTIONS.

An invention has recently been made which provides an escape door to be located at the side of railroad passenger cars, to be used in case of accident when the doors at the ends of the car have been closed by the telescoping of the car, or by the abnormal abutment of the timbers from any cause. This door is hinged at the bottom, and the fastening appliances are so simple that any one without previous instruction can open it in case of accident. The patentee is Mr. Joseph Parkinson, of Danville, Va.

A very simple car coupling has been patented by Mr. O. P. Mossgrove, of Steubenville, O. The drawhead of the car is provided with two hooked members, between which is pivoted a tumbling lever having an arm at right angles to it, which arm projects upwardly. The drawhead is further provided with a connecting clevis which, when the cars are to be coupled, is inclined against the projecting arm of the tumbler lever, so as to be thrown forward over the hooks of the other drawhead when the cars come together.

MECHANICAL INVENTIONS.

A very simple machine for splitting shingle is the subject of a patent granted to Mr. J. R. M. Crawford, of Booneville, Miss. The invention is designed to facilitate the manufacture of shingles, and the machine may also be used for making staves and laths, and notwithstanding the several uses to which it may be put, the machine can be made very cheaply.

Mr. James Menzies, of Fernandina, Fla., has recently patented some improvements in seal locks which are so much in use now on railroads, by express companies, and others. The present invention is intended to be applied to padlocks now in use, to effectually guard against the insertion of the key into the keyhole after the guard is applied without leaving evidence of the fact.

A simple and inexpensive leveling instrument for the use of farmers and others--not intended for professional surveyors--has been patented by Mr. Ernst A. Bostrom, of Newnau, Ga. A gravity plumb rod and level are combined and floated by a bearing point resting on a pointed staff which is adapted to be forced into the ground when the observation is to be made.

An improved lock to be opened by a sheet metal key, by its insertion in a projecting key barrel, has been patented by Mr. James Roche, of Terryville, Conn. This lock has the advantage over some others of its class in taking up every little space in the door, of being capable of countless variations and changes, for suiting other kinds of keys without changing any of the principles involved in the present lock.

Mr. Gilman Jaquith, of Maysville, Ky., has patented an improved spinning ring which is simple, cheap, and automatically effects its own lubrication without the necessity of frequently doing this by hand. The upper flange of the spinning ring is provided with an oil reservoir with inlet orifices for introducing the oil, and the oil is distributed through the natural pores of the thin metal.

A new bolting reel has been patented by Mr. J. M. Van Slyke, of Ottawa, Kas. This reel consists in a central prism-shaped chamber of woven wire into which the grain is deposited. As the wire in this chamber is rather coarse, only the larger kernels will be retained there, the finer material passing through into a section which is cylindrical in shape, and rotates concentrically within an outer cylinder which is covered with bolt cloth. This separates the flour from the fluff and other waste particles.

An improved saw tooth swage has recently been patented by Mr. Nathan L. Gano, of Fernandina, Fla. This invention consists of dies contrived to swage the points of saw teeth from the inside outward, to widen and sharpen them. By swaging the teeth outward, their length is increased, thus the saw will last longer besides giving a good clearance to the back of the teeth. The inventor claims to be able to gauge the points of the teeth of a circular saw to a true circle by his swage.

Mr. Rasmus F. Rasmussen, of New Albuquerque, New Mexico, has obtained a patent for an improved horse power. The machine is made in sections, and is so constructed that it can readily be separated into small light parts which may be handled by one person and can readily be set up again by one man. By this "knock down" system of construction, a large machine can be transported long distances over rough roads and put together again without the aid of a skilled workman.

An improved machine for winding secondary wires about the main or central wires of piano strings, which machine greatly facilitates the process and recommends itself on account of its simplicity, has been patented by Mr. Francis Ramacciotti, of New York city. The machine consists in a spinning lathe provided with a rotary spindle having graduated perforations with a longitudinal sliding center and a tension spring, all of which serves to rotate the central wire and carry it forward with the object of winding the secondary wire about the former.

Some improvements have recently been made in machines for measuring bagging, carpets, and other fabrics, and a patent has been obtained for the same by Mr. J. C. Williams, of Scotland Neck, N. C. The fabric to be measured is passed through the machine and is brought thereby in contact with a drum, which is of an accurately measured circumference, and is rotated by the action of the fabric. A dial which indicates exactly each revolution of the drum is connected with the latter, whereby the number of yards of the fabric passed through the machine is automatically recorded.

One of the most novel among the recent patents which have been granted for fire escapes is the invention of Mr. M. S. Washburn, of Billings, N. Y. This device is designed to serve under ordinary circumstances as a piece of furniture in the room, and is in the form of an easy chair. It is, however, connected with the ceiling by a rope which passes over a drum underneath the seat of the chair, so that in case of fire the chair may be thrown out of the window and held by an automatic brake. The person desiring to descend places himself in the chair outside the window, when he begins to descend. The speed is regulated by a friction brake attached to the chair.

AGRICULTURAL INVENTIONS.

Mr. George Simpson, of Bryan, Texas, has obtained a patent for an improved plow, the peculiarity of the invention consisting in giving the share and mould board such a form that they shall scour and clean readily in sticky soil. The form of mould board renders the plow quite light of draught.

An improvement in that class of gang plows in which a number are hauled by a single power, has been patented by Mr. William Kimmel, of Milton, Ind. The machine is so constructed that each plow will adapt itself to the lay of the land, and all of the gang will plow the furrow to the same depth. Means are employed for supporting the plows off from the ground while being transferred from one lot to another.

A very handy and efficient garden implement for cutting and removing briers, rank weeds, and wild shrubbery has recently been patented by Messrs. Frank P'Pool and E. S. P'Pool, of Edwards, Miss. This invention consists in a handle which may be provided in turn with a knife for cutting down the briers, and with a hook or fork for facilitating the handling of the briers and the bringing of them to a clearing after they have been cut.

An improved attachment for plows and cultivators for thoroughly upturning the ground, and at the same time leaving it level behind the machine, has been patented by Mr. Jonathan Harman, of Solomon City, Kas. This machine is designed more especially for plowing corn fields, and plows which are arranged in series behind the machine are so placed as to throw the soil around or away from the plants, and to work deeper or shallower in the ground as may be required. The plows are firmly pivoted to the lower ends of the plow beams, and are held rigid to their work by wooden pins of such strength as will resist the strain under ordinary circumstances, but which will break should any immovable obstruction be encountered, thus avoiding the breaking of the plow.

MISCELLANEOUS INVENTIONS.

Mr. George Smart, of St. Louis, Mo., has recently obtained a patent on an improved ventilator for rooms, which may be set up or removed without much trouble, and it is claimed to fulfill all the requirements of more expensive and complicated apparatus.

Mr. John McAnespey, of Philadelphia, Pa., is the patentee of a simple contrivance for holding the soap on wash tubs. The holder is attached to the handles of the wash tub convenient to the person washing, and may be removed when not required.

Mr. Peter M. Carpenter, of Buffalo Gap, Texas, has patented a composition of broom weed, sulphur, and water to be mixed together in certain proportions, and applied to sheep and other animals for the prevention and cure of scab.

Mr. Nelson Edwards, of Jericho, Vt., has patented a frictional connection for the bars and slats of window blinds. This improvement provides for keeping the slats of window blinds open at any desired degree, the means employed for accomplishing it being both simple and efficient.

An improved measure for grain spouts has been patented by Mr. Walter T. Bell, of New Rochelle, N. Y. A grain measure is attached to grain spouts in barns and stables, whereby the feed coming from a bin above may be measured and the exact quantity registered.

Mr. James H. Russ, of Providence, R. I., is the patentee of a combined weight and pull for window shades which is ornamental in appearance and very convenient in its application and operation. This invention belongs to that class of small patented wares from which a great deal of money is sometimes made.

An adjustable double telephone receiver is the subject of letters patent recently issued to Mr. D. G. Barnard, of Winslow, N. J. This receiver is made to be applied to both ears simultaneously, the diaphragm cups fitting closely to both ears, enabling a person to hear the sounds transmitted much more distinctly than when a single receiver is used.

Messrs. Robert S. McCall and Joseph W. McCall, of Kansas City, Mo., are the patentees of an improved bicycle, which is so constructed that the center of gravity is very low, and the vehicle not apt to tilt. By the improvements in the new bicycle, it is mounted easily, and the rider is not liable to be thrown over the front wheel when the same strikes against obstacles.

A simple, cheap, and convenient ticket holder and press has recently been patented by Mr. John Loudon, of Big Rapids, Mich. It is a simple screw press in which railway or other tickets are placed and held while being counted, or they can be filed away in the holder in a much more compact form than by tying with a cord, as is now the general practice.

An improved rib for cotton gins has recently been patented, the object of which is to make the wearing plate used upon cotton gin ribs adjustable, and this is accomplished by slotting the rib, forming a lug upon the wearing plate, and employing a screw for securing the plate upon the rib. Mr. Wiley Merritt, of Covington, Ga., is the patentee.

An easy back for carriage seats has recently been patented by Mr. F. W. Pendergast, of Rochester, Vt. This back is movable and is pivoted at its lower end in the arms of the seat, while at its upper end it is firmly supported and held in position by spring arms, which give the back of the rider a firm yet partially yielding support.

Mr. S. D. Muse, of Monticello, Miss., is the patentee of an improvement in that class of carriage way gate which is operated from the carriage, without obliging the person driving to alight. The opening and closing of gates after this plan is accomplished with accuracy and reliability, and will be appreciated by any one requiring a gate of this kind.

An improvement in springs for side bar vehicles has recently been patented by Mr. Jacob Hanser, of Oxford, O. Two or more flat leaf springs are connected to spring bars; levers are also pivoted to the said bars, which also connect with the side bars of the vehicle. By this arrangement of springs, levers, and bars, the vehicle is rendered very easy to the rider.

A patent thill for gigs and other two wheel vehicles has been patented by Mr. Anders Rasmussen, of Oshkosh, Wis. The thill is made in two parts combined with an adjustable device, for keeping the vehicle level regardless of the height of the horse. The invention is specially adapted for the two wheel village carts which are in such general use at the present time.

An improved device for slicing potatoes and other vegetables has been patented by Mr. Ferdinand Espel, of San Francisco, Cal. A knife is pivoted in the usual manner to a frame, so as to slice the vegetable with a downward slanting cut, having a cushioned cutting plate to relieve the cutter from the strain which would result from a rigid cutting plate. A gauge is provided for regulating the thickness of the slice.

A patent on an endless cable carrier for transferring buckets of water from wells, reservoirs, etc., to remote places has been granted to Mr. Carrell W. Crismon and the estate of Mr. A. F. Whitaker, deceased, of Vienna, Mo. While the invention is specially described for carrying water from wells to houses and stables, it is equally useful for transferring solid materials, dirt, ore, coal, etc.

A very simple device for securing firmly the spokes of wheels has recently been patented by Mr. Patrick Moran, of Grafton, W. Va. The hub is so constructed that in case the spokes of the wheel have shrunken, or become shorter from any cause, they may be thrust outward and thus be prevented from rattling by turning certain screws located within the hub of the vehicle.

A feather duster, in which the feathers are applied to coiled steel wire springs instead of directly to the handles of the duster, has recently been patented. The steel springs are connected with the handle, thus rendering the duster exceedingly flexible and enabling very short feathers to be used in their manufacture. Messrs. Henry Taylor and J. F. C. Elfers, of Brooklyn, N. Y., are the patentees.

An improvement in sounding boards for pianos has been patented by Mr. Justus Diehl, of New York city. The invention consists in forming a sound chest with a single opening extending across the main sound board from side to side, and in providing the sound boards with a number of sound posts which are so arranged as to vibrate in perfect unison with each other.

Letters patent have been granted to Mr. Samuel T. Richardson, of Baltimore, Md., for an improved hoisting gin, which is adapted for raising heavy weights. Three pieces of timber are joined together at the top, from which is slung the tackle to which the weight to be raised is attached; and although this apparatus is simple and easily transferable from place to place, it is capable of raising objects of some weight.

Mr. Thomas U. Mekeel, of Cold Spring, N. Y., has obtained a patent for an improved hand saw, whereby the blade may be set at any desired angle to the handle. A self-adjusting square and bevel attachment are provided, and these are set at any degree of angle to the saw blade desired, and a semiquadrant scale is affixed to the blade, which facilitates the adjustment of the angle pieces to the exact degree required.

An improved vehicle spring has been patented by Mr. William D. Bartlett, of Amesbury, Mass. The invention consists in the mode of hanging carriage bodies by connecting cross rods attached to the carriage body with side bars attached to the suspending springs by links, whereby great freedom of movement will be given to the body of the carriage. The forward and rear parts of the carriage body are connected with the axle by straps, so as to limit its movement upon the springs.

Mr. David Lowers, of Spring Valley, N. Y., has patented a stone cutter's mallet with an attached bellows or air blowing device, so constructed and arranged that by the act of using the mallet upon a chisel in the ordinary manner a jet of air by each stroke of the tool will be directed toward the point of the chisel, so as to blow away the dust, thereby protecting the eyes of the workman and at the same time clearing the stone of dust.

A novel and useful percentage calculator has been patented by Messrs. Sylvester J. Tucker and Edmund F. Kelly, of Richmond, Va. The invention consists of a graduated base having several series of numerals arranged thereon in horizontal, transverse, and quadrantal orders, respectively, and in such relation to each other that an arm pivoted to the base shall indicate the percentage a given number bears to a greater number.

An improved insect trap for catching and destroying ants and similar insects has recently been patented by Mr. James F. Bunnell, of Cisco, Tex. The invention consists in a trough quadrangular in form and V-shaped in cross section. This is forced into the mound of the ants' home, and is so placed that the insects cannot escape from the hill without passing into the troughs, from which they are unable to extricate themselves.

Messrs. P. H. Stein, of Austin, Tex., and James Tams, of Trenton, N. J., are the patentees of an improved fruit squeezer. This device consists in a pair of ordinary wooden pressing jaws hinged together at one end and provided with handles at the other. Each of these jaws is provided with a depression into which are firmly screwed fluted porcelain plates which serve to keep the fruit from slipping while being pressed, and which may always be kept clean on account of the non-absorbent nature of the porcelain.

Mr. Zachariah Hendrickson, of Syracuse, Ind., has obtained a patent for a velocipede, which unlike the general run of velocipedes and bicycles is designed to be steered by the feet and operated by the hands. This machine is provided with three wheels, the front wheel being the driving wheel, while the two rear wheels are pivoted with the frame and connected with the foot rests in such a way as to be readily turned, for guiding the machine around corners, etc.

An improved candle mould, in which the candle can be more readily removed from the die than is the case with the ordinary mould, has been patented by Mr. Joseph Brelivet, of Enosburg Falls, Vt. The mould is formed of two blocks which are provided with recesses for receiving the molten material, and with spools for holding the wicks, and eyes or loops for guiding the wicks directly through the middle of the candle apertures in the blocks.

An ingenious contrivance for holding balls of twine used by merchants in tying up packages has been patented by Mr. Reuben Melvin, of Cincinnati, O. The ball of twine is placed in a cup on the short end of a lever, the twine extending around the long portion. When the twine is being used the long arm of the lever is brought down near the counter, and when released the weight of the ball of twine on the short arm raises the long arm, carrying the free end of the twine up and out of the way.

Mr. T. A. Dennis, of Newark, N. J., has recently patented a fastener for boxes, trunks, etc. A latch with a hasp provided with ridges having notches in the lower ends constitutes the principal novelty of the fastener. The hasp fits into a casing provided at the lower end with a pivoted catch having a tongue and two inwardly projecting prongs, which pass into the notches in the ridges and hold the hasp in the casing. A spring attached to the casing acts on the catch and presses it against the hasp, thus securely fastening the box or trunk.

Mr. Joseph W. White, of Brighton, Iowa, is the patentee of an improved cork extracting implement. An upright support for a lever, rests in a socket which embraces the neck of the bottle and rests on its shoulder. After the insertion of the corkscrew into the cork it is attached to the short end of the lever, when the operator presses down the long arm of the lever, and the cork is extracted with ease. A cutting blade is formed on the end of the long arm, for severing the wire that holds the cork to the bottle.

Mr. David Berry, of Gualala, Cal., has obtained a patent for a one wheeled trotting sulky which is adapted for use especially in countries where the roads are rough, and through woods or over land which is ordinarily impassable to wagons. The shafts of this vehicle are so constructed and braced that it is next to impossible for the vehicle to overturn. The seat is mounted upon a long spring attached to the rear part of the frame of the vehicle, and the weight of the driver comes directly over the wheel.

An improved draught equalizer is the subject of a patent recently granted to Mr. Earl H. Cooper, of Winters, Cal. This equalizer is adapted for use where the single horse is attached to the short arm of the main tree, and to the other end of the tree it is designed that two horses shall be hitched. This draught equalizer is designed especially for use with harvesting machines, and it is claimed that by its use the draught of the three horses is exactly equal irrespective of the fact that it is desirable that the off horse should travel near the tongue.

Letters patent have been granted to Messrs. W. C. McDonnell and Axel L. Anderson, of Montello, Wis., for certain improvements in millstone picks. In that class of mill picks in which the pick head is formed of two plates clamped together by a screw for holding a blade, which can be adjusted in different positions, it is necessary to have at hand a screw driver or wrench for unscrewing the plates in the head. The invention now patented consists in fixing permanently in the head of the pick a wrench or screw driver, so as to have it at hand always when wanted to screw up the plates.

Mr. Delbert K. Woodward, of Lordstown, O., has patented within a few weeks two improvements in artists' easels. One invention consists among other novel arrangements in an adjustable extension shelf for supporting a picture while being copied, so that the artist may arrange the distance and position of the picture to meet his requirements without leaving his seat. The other invention consists of a series of corrugated shelves and a rack, all attached to the frame of the easel, for holding the artist's brushes and pencils convenient to his work.

Mr. John J. Callow, of Cleveland, O., has added another improvement to his previously patented process of wood graining by the use of stencil plates. The last patent is dated July 8, 1883. The several parts of the figure or pattern are made of thin sheet material, such as sheet brass or tin. These parts are made in separate pieces, cut out with shears; and what is cut away from one pattern may serve as a pattern in another plate. Thus every part of the material may be used. The several parts are then joined firmly together by wires and by suitable braces, the whole forming a stencil which is admirably adapted for graining wood.

Mr. Eugene F. Chapman, of Wilson, Neb., is the patentee of a wagon stake which is an improvement upon a patent granted to same inventor in October, 1881. The present wagon stake is so constructed as to receive internally an extension bar which is removable, and may be set up on the stake and bolted thereto, so that the carrying capacity of the wagon may be largely increased when desired. A coiled spring may be used in the chamber of the stake in place of the extension bar for supporting the wagon on springs. Devices are likewise provided for supporting temporary covering boards over the wagon box to protect the contents from the sun and rain.

An improved wagon brake which is automatic in its action, dependent upon the steepness of the hill and weight of the load, has been patented by Mr. Abraham W. Shue, of Fishersville, W. Va. The bolster of the front axle is provided with rollers upon which rests the body of the wagon, so that it may slide backward and forward, while the bolster of the rear axle is firmly attached to the box of the wagon. The brake is connected by suitable connections with the front axle, and when the wagon is going down hill and the horses are bearing upon the pole, the front axle will be slid back in its bearings, and the brakes brought to act upon the hind wheels with a pressure proportionate to the declivity and the weight of the load.

Business and Personal.

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

NEW BOOKS AND PUBLICATIONS.

A MANUAL OF MARINE ENGINEERING. By A. E. Seaton. Charles Griffin & Co., London; D. Van Nostrand, New York.

This is a volume of 440 pages illustrated with numerous tables and with engravings reduced from working drawings. The design is to supply a manual showing how to apply theoretical principles to the designing and construction of marine engines and their machinery, as determined by the practice of leading engineers. While the book is composed with consideration for inexperienced mechanics, it is very thorough and comprehensive, and appears to be particularly valuable to the draughtsman and constructive engineer, although the mechanical engineer will find much in its pages of use in his department.

Notes & Queries

HINTS TO CORRESPONDENTS.

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

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

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

Correspondents whose inquiries do not appear after a reasonable time should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them.

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

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

Correspondents sending samples of minerals, etc., for examination, should be careful to distinctly mark or label their specimens so as to avoid error in their identification.

(1) T. H. asks: Can a person make for his own personal use an article that is protected by patent right without infringing on the inventor's right? A. The general rule is that no one may make, use, or sell a patented article without the consent of the patentee. But the rule has exceptions: 1. Any person may make a patented article for experiment, that is, to ascertain, *bona fide*, if the article will operate as set forth in the patent. 2. Any person may make a patented article for the purpose of determining whether the statements in the patent are true. 3. Any one may make a patented article to be used in connection with new improvements as a model before the Patent Office.

(2) H. and M. ask for a formula for the preparation of a good polishing liquid to apply to name plates of bronze (not "phosphor"). A. First remove all scratches with emery paper or cloth, and then rub, using a buffer, a mixture of tripoli and sperm oil.

(3) C. H. W. writes: 1. I noticed in your Answers to Correspondents that corrosive sublimate will preserve birds' eggs. How am I to make a solution of it that will preserve the eggs and prevent the white ones from turning black? A. Corrosive sublimate is soluble in, 6 parts cold water, in 3 parts hot water, in alcohol, and in ether. Coat the eggs with the solution by using a camel's hair brush. 2. Will alcohol freeze when diluted one-half? A. The water will freeze, leaving the alcohol fluid.

(4) A. X. L. De C.—Parisian copying ink: A strong solution of logwood extract is treated with one per cent of alum and then with as much lime water, so that a permanent precipitate is formed. Some drops of weak calcium chloride are added, so that a perceptible bluish black color is attained, and hydrochloric acid is added drop by drop until a red solution is obtained. A little gum with half of one per cent of glycerine is added. To remove the ink from the chromograph, cold water and a sponge will suffice.

(5) W. A. G.—To polish agates for specimens: Grind the surface upon a true grindstone until you get a fair, smooth surface. Then rub them on a sole leather strap nailed to a board; wet the leather with water and apply crocus or rogue. The polishing must be done wet to give a fine gloss.

(6) J. D. G. asks: How much coal ought a good boiler to require per hour per horse power? How much water ought 1 pound of coal to evaporate into steam at 100 pounds pressure? How many square inches of grate surface for one horse power boiler? How many pounds of water required for each horse power? Will glass pressing against a wire rope wear the rope out as quick as brass would pressing against the rope? A. A first class boiler should produce 1 horse power per hour with the consumption of 6 pounds of anthracite coal; 1 pound of coal should evaporate from 9 to 10½ pounds of water at 100 pounds pressure when doing light work. If water foams in boiler, it will be carried over in a vesicular state or as wet steam, and indicates a larger percentage than is due to the power produced. In large boilers one-half to three-fourths of square foot of grate surfaces is allowed per horse power. In boilers under 10 horse power, 1 foot to the horse power. It requires about 62 pounds water to the horse power per hour.

(7) H. B. writes: I am going to work a marble quarry in Canada; will you please state where I can see the best appliances both for quarrying and sawing, in operation. A. Marble quarrying is carried on extensively in Vermont, near Rutland. Probably the finest appliances for sawing and dressing are to be found in the large marble works of New York and vicinity.

(8) R. S. writes: A mill dam is 1,000 feet from mill and 50 feet above it; we want to know which will give the most power with the same amount of water—to run it on an incline straight to mill, or to run it nearly level to mill and then perpendicular: Water to run in iron pipe and full capacity. A. Run it nearly level to the mill; you will then have the benefit of the whole fall. If run in a pipe, you lose the head required to overcome the friction of the pipe.

(9) A. D. asks: 1. Can you tell me how to bleach celluloid articles (restore their whiteness after they become yellow from exposure)? A. Sapolio can be used for this purpose. The manufacturers of celluloid furnish a preparation called celluline for this purpose. 2. What is the best sign writer's black, and how mixed to dry glossy and not oil the paper? A. This sign writer's black can be procured already mixed of desirable quality from large paint houses in this city. 3. What is the best oil for belting, and how applied? A. Castor oil is the best for this purpose, but any oil is of doubtful utility. 4. What happens to belts (on light work) that are not oiled? A. Nothing except usual wear. 5. What oil injures leather most? A. Kerosene is the most injurious oil to use. 6. How can bright iron be protected from rust? A. See SCIENTIFIC AMERICAN SUPPLEMENT, page 6270, No. 393.

(10) R. S. G. asks: What diameters are required for two rubber cylinders, say 10 or 12 feet long inflated with air, in order to sustain a weight of three hundred pounds in water? It is my intention to use these cylinders under a light framework as a raft or catamaran to fish in lakes in the north wilderness should they prove more portable than a canvas canoe. A. To immerse them about half their diameter, should be 10 inches diameter and 10 feet in length.

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

H. M. M.—No. 1 is pyrite (iron sulphide) in quartz. No. 2 is quartz. Gold is generally found in pyrite or in quartz.—J. W. U.—No. 1 is a slate containing pyrite (iron sulphide). No. 2 is a compact sandstone containing pyrite. No. 3 is a close grained sandstone showing specks of iron sulphide. Nos. 4 and 5 are different varieties of the same mineral as No. 3, with pyrite running through them. They are all of no apparent value except the building purposes.

COMMUNICATIONS RECEIVED.

On Guided Balloons. By T. F. S. T.
The Doctrine of Numbers. By G. B.

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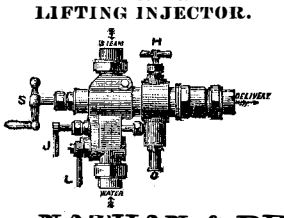

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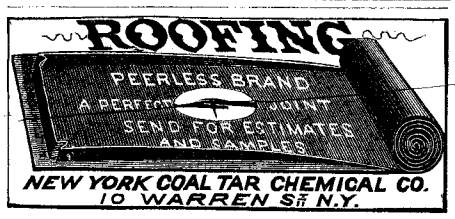

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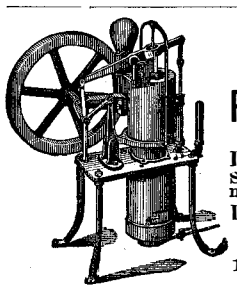

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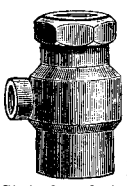

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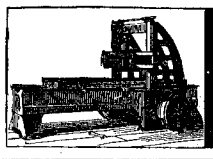

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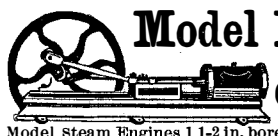

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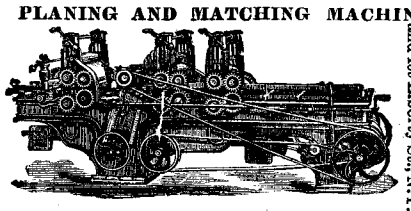

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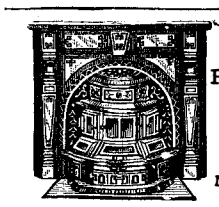

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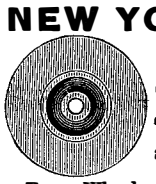

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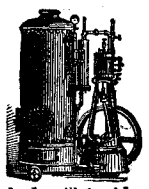

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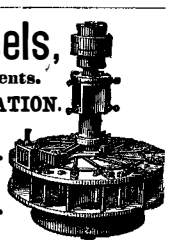

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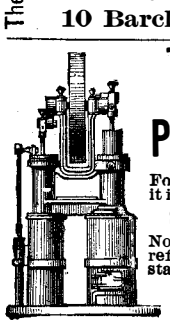

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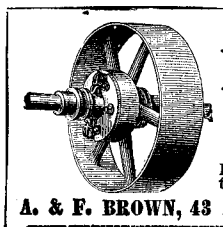

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