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MANUFACTURE OF ELECTRIC LAMPS.

A factory has been fitted up in Bermondsey Street, London, by Messrs. Wright and Mackie, electrical engineers, of Grace-church Street, for the Hammond Electric Light and Power Supply Company, for the purpose of making incandescent lamps. The factory at Bermondsey Street consists of four floors, having a total area of about 4,800 superficial feet. In the basement is an eight horse power semi-fixed compound expansive engine, by Marshall and Sons, working at 180 revolutions per minute, from which the power is transmitted to a 300-light Ferranti alternate current machine, with Siemens exciter, and a 600 volt Siemens alternate current machine and exciter. The Ferranti machine is employed for lighting the building, heating the carbon filaments during the process of exhaustion, and for general experimental purposes, while the Siemens machine is used in the process which deposits carbon in the pores of the filaments. The ground floor is devoted to a store room, and the glass-blowing room. In the latter twelve mechanical glass blowers are arranged, driven by power shafting, which also works a series of air compressors for supplying air to the blow-pipe flames, and the necessary high pressure air for blowing out the bulbs. The machines in this room are manipulated by boys ranging from fourteen to sixteen years of age, who are employed in the various processes of blowing bulbs and sealing in the carbon filaments.

The mechanical glass blower, as may be seen in Fig. 1 in the engraving, is very similar in construction to a lathe, but is supplied with two headstocks fitted with hollow mandrels and chucks, which hold the glass tube to be shaped. The mandrels revolve synchronously, the one headstock being a fixture and the other capable of traversing the bed by

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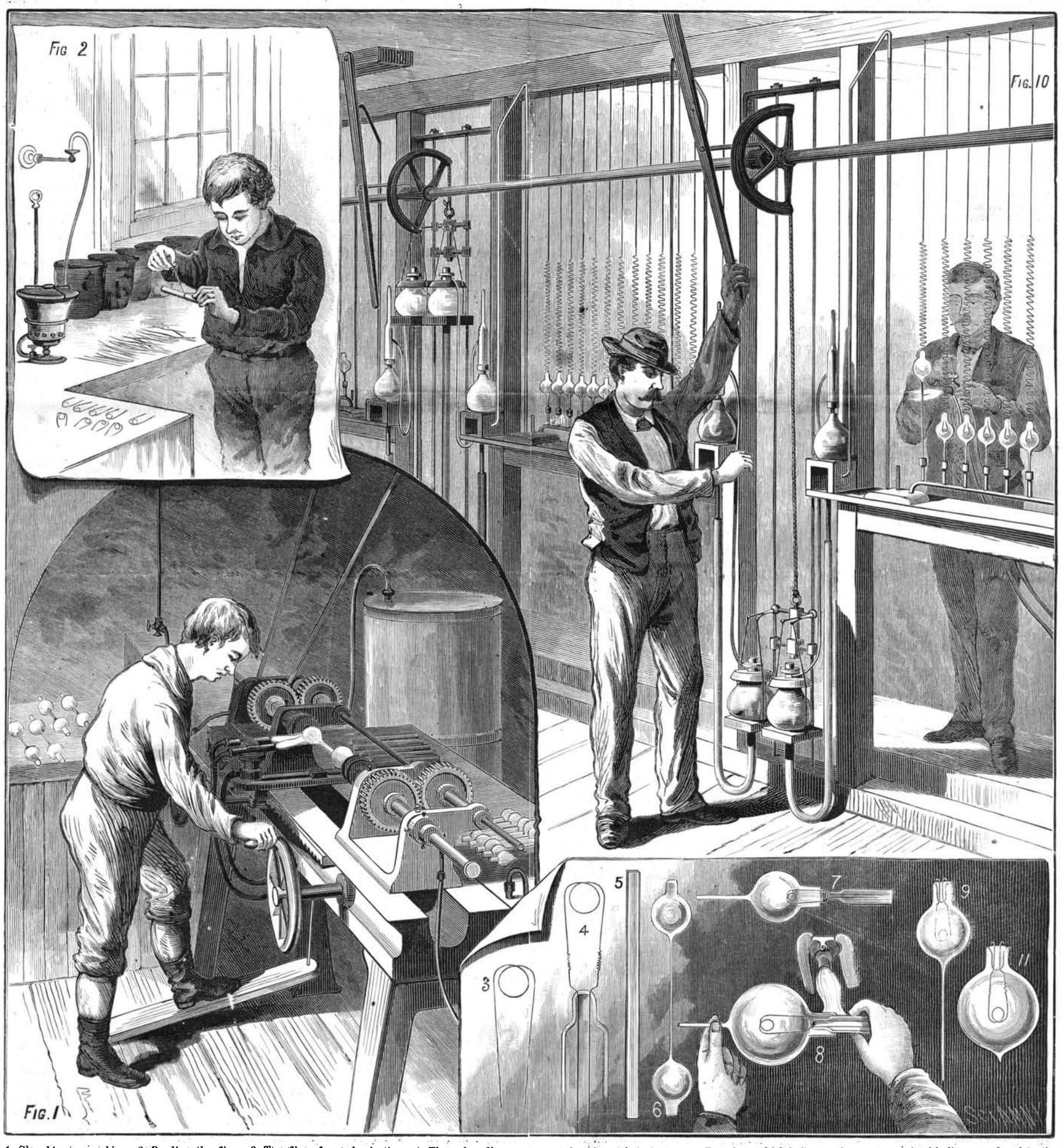

1. Glass blowing machine.—2. Bending the fiber —3 The fiber after carbonization.—4. The carbon filament connected with metal electrodes.—5. Tube from which bulbs are blown.—6. A pair of bulbs as produced by the glass blowing machine.—7. Inserting the carbon in the bulb.—8. Sealing the bulb.—9. Bulb ready for exhaustion.—10. Exhausting and sealing the bulbs.—11. The complete lamp.

WRIGHT AND MACKIE'S MACHINERY FOR MAKING INCANDESCENT ELECTRIC LAMPS.

Scientific American.

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NEW YORK, SATURDAY, JUNE 30, 1883.

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(Illustrated articles are marked with an asterisk.)

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THE SCIENTIFIC AMERICAN SUPPLEMENT

No. 391,

For the Week ending June 30, 1883.

Price 10 cents. For sale by all newsdealers.

AN INTERESTING PATENT OFFICE QUESTION.

The applicant for a patent usually intrusts the management of his business before the Patent Office to a competent agent who acts under the authority of an ordinary power of attorney, which is filed with the Commissioner of Patents. It frequently happens, for reasons satisfactory to the applicant, that he desires to change his attorney, and heretofore it has only been necessary to file with the commissioner a revocation of the original power with substitution of the new.

The Commissioner of Patents has lately made a new rule which provides in substance that the Patent Office will not in future recognize any change of attorneys during the pendency of the case, unless reasons satisfactory to the commissioner are first presented to him. The commissioner thinks the new rule is necessary in order to facilitate the business of the Patent Office, as it saves the office the trouble of looking back to see if any change of attorney has been made, etc.

Several applications have been made to the commissioner for change of attorneyship, in which the applicants have represented to the commissioner, as reasons, that they were not satisfied with the manner in which their original attorney was managing their matters; or, for reasons personal to themselves, they could not consent to leave their business any longer in such attorney's hands. These reasons have not been accepted by the commissioner, and he has declined to permit the desired change of attorneyship.

On the other hand, when the applicant has stated as reasons for desiring to change attorneys, that his original agent has mismanaged the case or neglected it, or is unable further to prosecute it, then the new power has been received and the new attorney recognized; the original attorney not being allowed to be heard or defend himself against these imputations.

In other words, the only way at present by which an applicant for a patent may secure a change of attorneys is to file with the Commissioner of Patents an *ex parte* statement specially derogatory and damaging to the original attorney, if not libelous.

It has been specially objected to the Commissioner of Patents that he had no authority under the statute to make a rule that is inconsistent with law; that a rule which restricts the right to constitute and revoke powers of attorney is inconsistent with law; that it is a canon of elementary law that every power of attorney may be revoked at will, unless coupled with an interest; that the rule in question is mischievous because it encroaches upon private rights; that it is void because it is an attempt to legislate by one of the executive departments; that it is dangerous because, as seems probable, the courts will not recognize the commissioner's authority to prohibit a revocation of a power of attorney; and if the Patent Office should grant a patent upon amendments made by an agent whose power had been revoked by notice to the commissioner, the validity of such patent might be questioned.

In reply to these objections and to request that he would cite the law for his authority for upholding the rule, the Commissioner of Patents states that the rule was adopted after full consultation with the Secretary of the Interior, and since its adoption has been sustained by him on an appeal; furthermore, he, the commissioner, is of opinion that it is within his power and that of the Secretary of the Interior to say upon what grounds powers of attorney may be revoked and new powers filed. Here the matter rests, the commissioner not having given his special view as to the law of the matter.

CALIPERS AND FIXED GAUGES.

For fine work in the machine shop the old fashioned bow calipers are going out of date and are being superseded by more reliable gauges. Calipers may still be useful for gauging coarse work and making comparisons of relative sizes of considerable difference; but the growing demand for exact work and increasing adoption of unvarying standards of sizes in the shops, are fast driving out all adjustable gauges and particularly the unreliable calipers.

There are two elements of uncertainty and inaccuracy in calipers—the screw adjustment and the length and comparative weakness of the bows. The slightest touch is sufficient to start the "butterfly" nut on the screw, and the nut and screw are never threaded with sufficient accuracy to prevent backlash. Besides this, the riveted end of the screw allows of more or less play, imperceptible, it may be, just at that point, but causing a serious mismeasurement at the points of the bows—the points where the accuracy is demanded. Then the bows themselves are so slender as to "give" quite readily under even a slight pressure. As all measurements by calipers, or similar gauges, are determined by the sense of feeling and not by sight, it is obvious that the utmost rigidity is necessary in the measuring implement. This rigidity is impossible in a pair of calipers.

In place of this implement, which is adapted to any and all variations of diameters between certain fixed limits, the best shops are adopting solid tool-steel gauges of standard sizes varying by fractions of an inch as on the ordinary rule, sixty-fourths and thirty-seconds, or by thousandths of an inch, five-thousandths usually. The gauges are horse-shoe shaped jaws with parallel faces ground to one fifty-thousandth of an inch for exactness, and furnished with handles convenient for lathe use or for bench use, the handle for the lathe gauge being in line with the parallel jaws, and that for the bench gauge being at right angles to their faces, making it handy for use as a snap gauge. The gauges are hardened and then ground to finish size. The limit of exactness of these solid gauges is fixed at one fifty-thousandth of an inch, as that has been found to be the limit of sensibility in the experienced workman's fingers; a skillful workman can detect errors in measurement by feeling up to that almost insignificant fraction of an inch.

Such delicacy of measurement is not practicable with calipers, nor can a much lower limit of accuracy be assured by the calipers. When, therefore, first class shops permit no fits to pass which do not come up to the standard of one four-thousandth or one five-thousandth of an inch it is manifest that some gauge of greater accuracy than the spring calipers is required.

HIGH BUILDINGS AND FIRES.

The increasing tendency of land owners and builders in large cities to utilize the ground area as much as possible by erecting lofty buildings, requires some commensurate means to prevent fires and to stay their progress. Our best steam fire engines are wonderful improvements on the old time hand engines, and they can force an unbroken stream of water in round, solid column for a considerable distance from the nozzle, unless exposed to a high wind or the direct heat of a raging fire. But these adverse conditions often exist and turn the water column into diffused spray, or dissipate it into mist or vapor, when most of its effective force is lost.

Recent experiments, however, suggest that if the force of the engine could be exerted on a confined column of water rising vertically to the roof, sufficient power would remain in the impulse from the engine to deliver streams of solid water over the area of any ordinary city building. A steam fire engine was recently tested which threw water 156 feet horizontally from a one inch nozzle attached to a 2½ inch hose running 2,700 feet on a level and 200 feet above the engine. In this instance a very large column of water was made to deliver a moderately small column at a great height above the engine; but by the employment of two or more engines on the same hose, by means of the two-way or the four-way butt, a result may be reached which will place the roofs of the highest buildings under the control of the firemen.

This can be effected by a fixed stand pipe attached to the building so as to be easily reached by the firemen from the street. This stand pipe is, in effect, a prolongation of the ordinary engine hose, and the nozzle, with a convenient length of handling hose, may be attached to the top of the pipe, or to an opening on any floor.

Incubation of the Ostrich.

Some will sit throughout with the most solicitous maternal instinct; . . . others manifest such anxiety that, when the hen has been a little late in taking her morning turn upon the nest, the male has gone out, and, hunting her up, has kicked her to the nest in a most ungentlemanly manner. Some are very affectionate over their young, others the reverse; thus do individuals differ even among ostriches. As a rule the cock bird forms the nest, sits the longest, and takes the burden of the work of hatching and rearing. Contrary to what has been currently understood, and what is still stated even in recent colonial accounts, the cock bird sits at night. In this peculiarity, the *London Field* thinks the hand of Providence may be seen, for the worst enemies of the nest appear at night, and the cock, being stronger and braver, is better able to resist them; moreover, the same authority concludes that, the feathers of the cock being black, night-sitting does not expose him to the exhaustion from the sun's rays which would ensue if he sat during the day; while at the same time the gray feathers of the female are less conspicuous while she sits during the day.

Photographing the Vocal Organs.

Some attempts have been made in London to photograph the human vocal organs in the act of singing. The principal object was to obtain a picture of the ligaments known as the vocal cords, which are situated at the top of the larynx. These can be viewed in the laryngoscope, a small mirror, which when placed at the back of the throat serves at once to reflect light upon the membranes, and to form an image of them visible to the observer. With the aid of this instrument numerous observations have been made upon singers, and much valuable information has been collected, but all previous efforts to obtain a photograph by substituting a camera for the observer's eye have entirely failed. The difficulties were overcome by the use of a powerful Siemens electric lamp, supplied by a dynamo machine. By means of this light some excellent photographs were obtained of the laryngoscopic image. The patient in each case was Herr Behnke, at whose instance the experiments were made.

Improved Buildings in New York.

The character of the buildings now being erected in New York city differs greatly from those which have been built for the last twenty years, not alone in style and the tendency to extreme height, but in excellence of material and of workmanship. The day of brown stone veneers and brick shells has gone, and capitalists are putting money into buildings in the evident belief that it is *real* estate. Good building stone, granite or limestone, and hard burned bricks are used instead of iron for the outside walls, rolled iron beams take the place of timber and plank for floor supports, and cellular tile or porous clay blocks take the place of studding and lath for partitions.

REPORTS OF THE RECENT SOLAR ECLIPSE.

The members of the astronomical expedition sent out to the Caroline Islands last March, by the National Academy of Sciences, to observe the total solar eclipse of May 6, have arrived at San Francisco, Cal. A party of five observers sent by the French government arrived at about the same time as the American party, and made simultaneous observations at the Islands.

During the time of the eclipse the weather was not entirely favorable, thin clouds and a hazy atmosphere somewhat interfering with continuous observation. But all four contacts were observed, and the entire period of totality was utilized. The spectroscopic observations by Dr. Hastings with a 60° prism attached to a 6¼ inch equatorial were interesting. By placing two reflecting prisms in front of the slit, the spectrum from two opposite sides of the limb could be brought into juxtaposition and examined simultaneously. This was used to observe the appearance of the 1,474 coronal line on the eastern and western limbs of the sun and to note the changes as the eclipse progressed.

At the beginning of totality, the 1,474 line on the eastern limb was bright and extended about 12′ from the sun's edge, while on the western limb it was faint and only about 4′ in length. As the eclipse advanced this inequality vanished; the lines became sensibly equal in height and brightness at mid-eclipse, while at the close of totality the conditions at the beginning were reversed, the line on the western limb being the longer and brighter. Dr. Hastings regards this observation as conclusive proof that the outer corona is mainly a phenomenon of diffraction, since this change was many times greater than any due to the moon's motion alone.

The bright hydrogen and magnesium lines were seen, and Dr. Hastings noted the dark D lines. The relative heights and brightness of the coronal rings, C, D, and 1,474, were estimated. Mr. Preston noted radial polarization. The chromosphere was unusually quiescent and the prominences few. The corona was bright and was characterized by five well defined streamers, which were sketched by Dr. Dixon. The azimuths of the shadow fringes at the beginning and end of totality were obtained and their distances estimated.

The radiation observations showed that the receipt of heat by the earth from any source was almost wholly checked.

No intra-Mercurial planets were discovered, the search being conducted by Professor Holden, of the American party, and by two of the French expedition.

ASPECTS OF THE PLANETS FOR JULY.

JUPITER

is evening star until the 5th, and then morning star for the rest of the month. The giant planet is a busy member of the solar community during July, as the monthly record shows. He figures as chief actor in four of its principal incidents. He is in conjunction with the sun, in conjunction with the moon, in conjunction with Mercury, and in conjunction with Venus. On the 5th, at 10 o'clock in the morning, he is in conjunction with the sun, one of the grand epochs of his course. He rises and sets with the sun, and is entirely hidden in his rays; passing behind him and reappearing on his western side, he commences his course as morning star. Before the month closes he will be visible, in the northeast, shortly before sunrise. While we are sorry to miss his superb presence in the evening sky, we shall find compensation for the loss in the beautiful appearance he will present in the summer mornings, increasing all the time in size and brilliancy. For our big brother will be traveling toward us and growing brighter until he reaches opposition next January.

Jupiter is in conjunction with Mercury on the 20th at 4 o'clock in the morning, being thirty-two minutes south. The planets cross each other on the celestial track, Jupiter traveling west and Mercury traveling east. The planets rise about 4 o'clock, but are too near the sun to be visible, observers thus missing the sight of the largest and the smallest planet when just as far apart as the average diameter of the moon. On the 26th, at 8 o'clock in the morning, Jupiter is in conjunction with Venus, passing ten minutes south at the nearest point of approach. The planets will be near enough to be worth looking after when they rise not far from half past 3 o'clock, an hour and a quarter before sunrise. Observers must look for them in the northeast, about three degrees north of the sunrise point.

The right ascension of Jupiter is 6 h. 53 m., his declination is 22° 57′ north, and his diameter is 30·4″.

Jupiter sets on the 1st not far from half past 7 o'clock in the evening; on the 31st, he rises about half past 3 o'clock in the morning.

VENUS

is morning star. The interesting incidents in her progress are her near vicinity to Mercury in the first part of the month, and her near vicinity to Jupiter in the last part of the month. The morning sky is alive with these charming wanderers in the celestial depths, whose movements give life to the monotonous solemnity of the fixed stars and add the element of variety to the study of the heavens. It is seldom that the same planets are in conjunction twice during the same month, but such is the case with Venus and Mercury. On the 3d, at 11 o'clock in the evening, Venus is in conjunction with Mercury, being 2° 3′ north. On the morning of the 4th they will be near each other, and the exhibition will be of the first order, the planets rising soon after 3 o'clock. The observer must look for them in the northeast. Venus will be readily recognized about half a degree south of the sunrise point, and will serve as a guide to Mercury, between two and three degrees farther south. The same planets are in conjunction on the 8th, at 11 o'clock in the evening, Venus being 1° 18′ north. On the morning of the 8th and 9th they will be nearer each other than at the previous conjunction, and will reward the effort it will cost to be present at the exhibition. After the second conjunction Venus lags behind, and at the end of the month is sixteen degrees behind her fleeter footed rival. The close conjunction of Venus with Jupiter on the 26th, one of the brilliant events of the month, has been referred to.

The right ascension of Venus is 5 h. 5 m., her declination is 22° 4 north, and her diameter is 10·8″.

Venus rises on the 1st a few minutes after 3 o'clock in the morning; on the 31st, she rises about a quarter before 4 o'clock.

MERCURY

is morning star until the 29th, and evening star the rest of the month. On the 2d, at 2 o'clock in the morning, he reaches his greatest western elongation, being 21° 39′ west of the sun. His high northern declination makes this the most favorable opportunity during the year for observing him as morning star, and his vicinity to Venus affords a sure means of detecting his fitful presence, so brilliantly beautiful and so different from that of every other planet that once seen, the impression is never lost. We have seen him as a brilliant white star resembling Sirius, a delicate rose colored star unlike any other, and a bright golden star, more fiery than any of his companions. Mercury and Venus are both traveling in the same direction, eastward toward the sun, but the swiftest of the planets reaches the goal long before the most beautiful.

On the 29th, at 6 o'clock in the evening, Mercury is in superior conjunction with the sun. His short role of morning star is ended, and passing behind the sun, he reappears on his eastern side as evening star to repeat the same ceaseless course, varied by the incidents that make his pathway round the sun an unending source of pleasure to those who love to follow his steps.

The right ascension of Mercury is 5 h. 8 m., his declination is 19° 40′ north, and his diameter is 7·2″.

Mercury rises on the 1st about a quarter after 3 o'clock in the morning; on the 31st, he sets about half past 7 o'clock in the evening.

SATURN

is morning star, and an interesting object for observation in the small hours of the night, rising before 1 o'clock at the close of the month. Observers will welcome the ringed planet as his footsteps tend toward the nearest approach to the earth, for he will take on a more splendid appearance than he has done for nearly thirty years. His widely open rings, his high northern declination, and his approaching perihelion form specially favorable conditions for observation. These conditions will culminate in 1885. Therefore every student of the stars should make Saturn a special theme for investigation during this year and the two succeeding years, for nearly a whole generation of observers will pass from the earth before the conditions are repeated.

Saturn marks his course in July with but one incident, his conjunction with Mars on the morning of the 20th. The nearest approach is at 8 o'clock, when Saturn is 1° 28′ south. The planets rise on that morning soon after 1 o'clock. They must be looked for in the northeast, where the morning stars congregate. Saturn is a little more than a degree south of the sunrise point, and Mars a quarter of a degree north of it. Saturn will be easily found, and his ruddy neighbor will shine a short distance to the north.

The right ascension of Saturn is 4 h. 12 m., his declination is 19° 19′ north, and his diameter is 15·8.″

Saturn rises on the 1st, not far from half past 2 o'clock in the morning; on the 31st, he rises at half past 12 o'clock.

MARS

is morning star. His course is devoid of events, save his conjunction with Saturn, whom he seemingly allows to overtake and pass him, just as he allowed Neptune to do the same thing in June, though the three planets are all traveling toward opposition.

The right ascension of Mars is 3 h. 25 m., his declination is 18° 6′ north, and his diameter is 5·2″.

Mars rises on the 1st about a quarter before 2 o'clock in the morning; on the 31st, he rises a few minutes before 1 o'clock.

NEPTUNE

is morning star. Though invisible, he is now the first of the morning stars to make his appearance. Mars comes next in order, rising at a quarter before 2 o'clock. Saturn follows at half past 2 o'clock. Venus puts in an appearance a few minutes after 3 o'clock, and Mercury completes the list after an interval of ten minutes. It is interesting to watch the rising of so many planets so near each other, and all traveling far north.

The right ascension of Neptune is 3 h. 13 m., his declination is 16° 10′ north, and his diameter is 2·5″.

Neptune rises on the 1st, about half past 1 o'clock in the morning; on the 31st, he rises soon after half past 11 o'clock in the evening.

URANUS

is evening star, traveling on an uninterrupted course toward conjunction.

The right ascension of Uranus is 11 h. 23 m., his declination is 4° 44′ north, and his diameter is 3·5″.

Uranus sets on the 1st, at 11 o'clock in the evening; on the 31st he sets shortly after nine o'clock.

THE MOON.

The July moon fulls on the 19th, at forty-seven minutes after 10 o'clock in the evening. The waning moon is in conjunction with Saturn on the 1st, at seven minutes before 6 o'clock in the evening. Crescent and planet are at that time only twenty-two minutes apart and invisible. The conjunction gives another proof of the proximity of the moon's path to that of Saturn. In some portions of the globe, between latitudes 14° north and 43° south, the conjunction will be an occultation, making the fourth occultation of Saturn that has occurred during the year. The moon is again in conjunction with Saturn on the 29th, at 5 o'clock in the morning, being forty-four minutes north. This conjunction is an occultation in some portions of terrestrial territory between latitudes 7° and 70° south, making the fifth occultation of Saturn during the year.

The old moon is in conjunction with Venus and Mercury on the 2d, being only seventeen minutes south of Mercury. But the conjunctions take place in the afternoon, when the sunlight renders them invisible, and when the planets rise the next morning the moon will have sped several degrees on her eastward course. On the 4th the moon is at her nearest point to Jupiter, on the 9th to Uranus, on the 28th to Neptune, and on the 29th to Mars.

New Method for Providing Iron with Bronze Colored Oxide Coatings.

All bronzing or browning methods, known at present, obtained by moistening iron with acid, copper, or iron solutions, permitting them to dry in air, brushing off the rust formed in this manner, and repeating the operation several times, only produce a more or less light or dark red brown rust coating upon iron articles. Barff's process as well, as also the heating of iron articles in superheated aqueous vapor, only causes an iron protoxide layer upon iron. These last mentioned two methods have the further defect that the protoxide of iron layer peels off in a short time, whereby rust is invited.

Iron articles are easily coppered or brassed by dipping in copper solutions, or else coppered or brassed by the galvanic method; these coatings also scale off after a short time, especially if the iron surface was not thoroughly cleaned, when exposed to the influence of moist air. By the following process it is easy to provide iron articles with a handsome bronze colored protoxide coating; it resists the influence of humidity pretty well, and besides this, the operator has it in his power to produce any desired bronze color in a simple manner.

The cleansed and scoured articles are exposed to the vapors of a heated mixture of concentrated hydrochloric and nitric acids (1 and 1) for from two to five minutes; and then, without unnecessarily touching them, heated to a temperature of 300° to 350°. The heating is continued until the bronze color becomes visible upon the articles. After they have been cooled, they are rubbed over with petroleum jelly, and again heated until the jelly begins to decompose. After cooling, the article is anew rubbed over with petroleum jelly. If now the vapors from a mixture of concentrated hydrochloric and nitric acids are permitted to operate upon the iron article, light red brown tones are obtained. However, if acetic acid is mixed to the mentioned two acids, and the vapors permitted to operate upon the iron, oxide coatings are obtained, possessing a handsome bronze yellow color. All gradations of colors from dark red brown to light red brown, or from light bronze yellow to dark brown yellow, are produced by varying the mixtures of the acids.

I have in this manner coated T-rods, 1·5 meters long, for iron boxes, with such oxide layers, and to-day, after ten months, during which time they were continuously exposed to the influence of the air of my laboratory, constantly laden with acid vapors, they do not betray the slightest traces of change.—*Prof. Dr. J. Oser, in Dingler's Polyt. Journal.*

Wine Ferments.

The researches initiated by M. Pasteur upon the alcoholic ferments promise to have an important influence, not only upon beer brewing, but upon the apparently less artificially conducted process of fermentation that goes on in the production of wine. It seems quite probable that the quality of the wine of any year is as much affected by the particular mould which predominates during the fermentation as by the amount of sunshine or rain during the growth of the grapes, or even the passage of a comet through the sky. In Germany it is already the practice to sterilize the must and then to sow it with some selected ferment, a process favorable to the elimination of various "false" ferments (species of *Dematii*) that are common to the surface of the grape and other fruit, while the custom in some southern countries of decanting the must as soon as the first foaming appears may have the same effect. In a recent communication (*Comptes Rendus*, xcvi., 1369) M. Le Bel incidentally remarks that last year none of the grape collection with which he had to do underwent fermentation influenced by what Pasteur considers to be the true wine ferment, *Saccharomyces ellipsoides*, Rees, but was all fermented by *S. pastorianus*. M. Le Bel also states that a natural must yields a larger proportion of the higher alcohols than a solution of sugar fermented with the same ferment, and as the higher alcohols are more injurious to health than ordinary alcohol, it would appear that a beer made partly from sugar is quite as wholesome as one made solely from malt.

RAISING OF THE AUSTRAL.

Our readers will remember that in November last year information was received of the sudden sinking of the Austral in Sydney Harbor. From the inquiry held at Sydney, it appears that the vessel was lying without cargo on board, and that the water ballast provided for steadying her under such circumstances had been removed from the double bottom of the vessel, and that she was being coaled. The coal ports were wide open, and coal was placed too much on one side of the vessel, so that some of her port sills on the starboard side were brought under the level of the water. Before the state of matters was noticed a large quantity of water had entered the bunkers. The vessel gave a sudden lurch, filled, and went down in about a quarter of an hour from the time when the alarm was given.

As a matter of interest we give an illustration from *Engineering*, showing the method adopted for raising her. The managers of the Orient Company, to whose line the Austral belongs, consulted Mr. John Standfield (of the firm of Clark & Standfield), and have been guided by his advice throughout. The operation was carried out by Mr. Twill, the company's manager at Sydney, assisted by Mr. George Eldridge, the company's naval architect, who was sent specially to Sydney to take charge of the work. The vessel was lying on her bilge with a list of 13 degrees to starboard, as shown in the sketch, the greatest depth being about 51 feet aft.

Considerable experience and study of the conditions of raising sunken ships led Mr. Standfield to at once decide that the safest and quickest, and also the cheapest method of refloating the Austral, would be by pumping out the water from her, thus restoring buoyancy directly to the vessel herself, and avoiding the use of any external means of lifting.

It was at first proposed to close the openings in the vessel by means of divers, and to surround such openings as the engine and boiler hatches, and the cabins, saloons, chart-houses, etc., by cofferdams, having water-tight connection to the decks, and after providing air pipes to every water-tight chamber to pump the water out of the vessel. Owing, however, to the want of a sufficient number of skilled divers, this arrangement was modified, as here shown. The sides of the vessel were continued above the water level by means of a cofferdan 410 feet long, and having a depth of 27 feet; this was provided with one water-tight transverse bulkhead amidships, thus dividing the entire structure into two water-tight compartments, facilitating control during the operation of raising. This cofferdam was formed of vertical timber frames, equally placed at short intervals apart; each pair of frames was supported by a transverse strut, the weight of which was taken by two small vertical struts which were secured longitudinally by walings.

The outer skin of the cofferdam was formed by longitudinal planks about 4 inches in thickness, and was made water-tight by a covering of sheets of canvas tacked on the planking, and extending some distance below the lower edge so that the pressure of the water could accommodate it to the hull of the vessel; this made an effectual water-tight joint between the cofferdam and the vessel. The framing of the cofferdam was secured to the hull by means of bolts passed through the scuttle lights and through oak toggles on the inside, and similarly to other toggles or stringers passing behind the stanchions of the promenade deck. The whole of this work was fully prepared on shore to the required dimensions ready for bolting and spiking in position. The skin planking was prepared in sections consisting of four or five planks 16 feet long, which were weighted and lowered in position by small craft alongside, as shown, and were secured to the framing by spikes. A number of centrifugal pumps were fixed over the forehold and over the afterhold, in the ordinary manner, and as the pumping rapidly proceeded, the vessel came nearly upright, and before the main deck was awash she commenced to rise. This was on the 28th of February, and on the following day, as she rose, she was towed into Neutral Bay, into a secure position in shallow water with a level bottom; part of the cofferdam was then removed, and the pumps were lowered and placed more advantageously for completing the operation. Steam to some of the pumps was supplied through a flexible hose from a steamer alongside.

Fig. 1

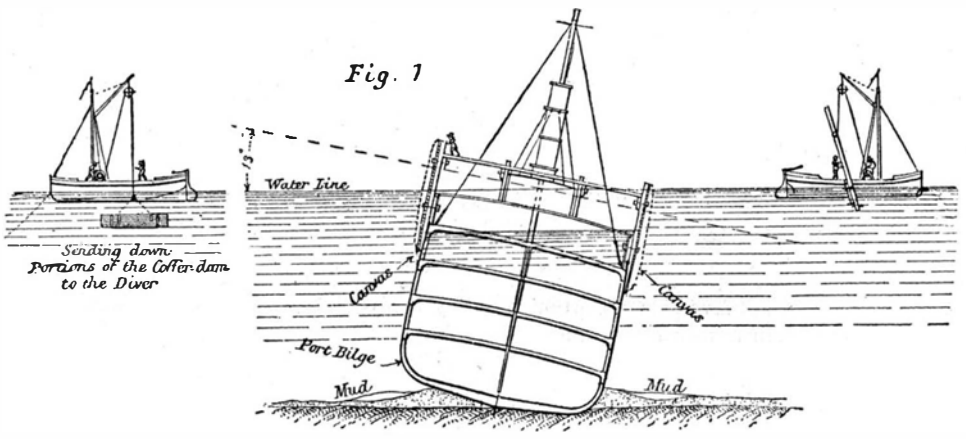
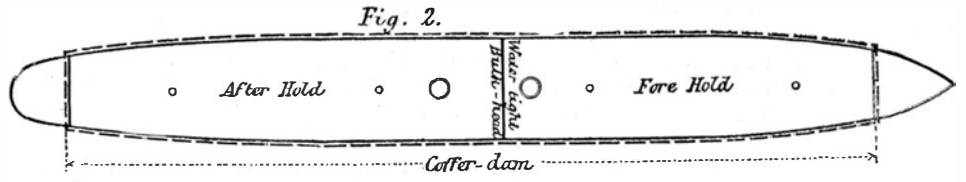


Fig. 2.



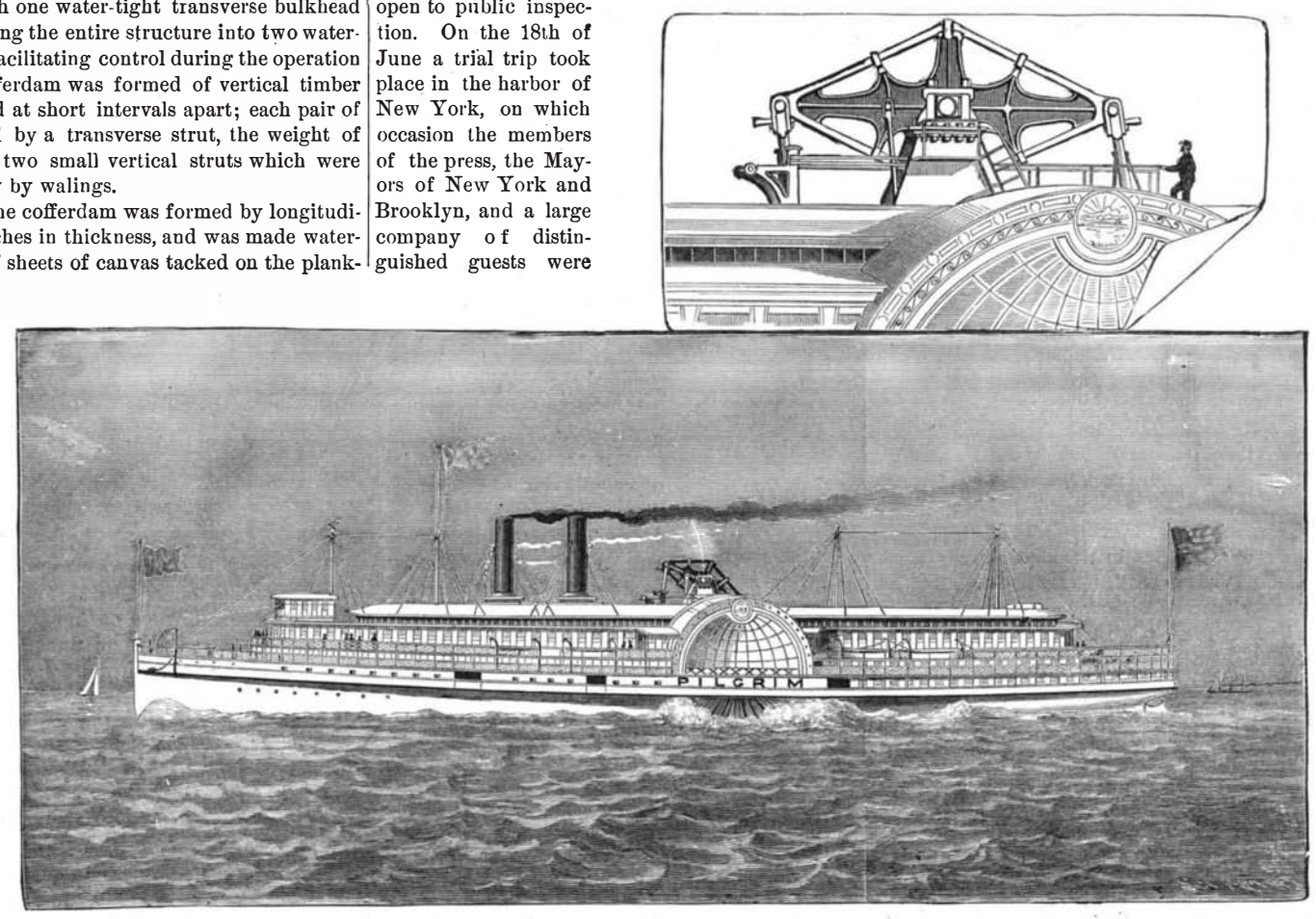
RAISING OF THE STEAMSHIP AUSTRAL.

Mechanical Equivalent of Heat.

Prof. A. Bartoli has recently found the value of 428·4 kilogrammeters (771·12 ft. lb.) for the mechanical equivalent of heat, by the following method: He used a steel tube into which he introduced a known quantity of mercury at a pressure accurately determined and at the temperature of freezing water. The interior diameter of the tube was so small, and the length so great, that the mercury, on its exit from the tube, had scarcely any velocity. Keeping the temperature of the tube at the freezing point by means of ice, he measured the quantity of ice melted, and thus estimated the quantity of heat developed.—*Riv. Sci. Industr.*

THE STEAMER PILGRIM.

In the SCIENTIFIC AMERICAN for July 8, 1882, we gave illustrations of the process of forging the great shafts of the large steamer Pilgrim, at the celebrated works of John Roach & Company. This grand vessel is now complete, and was lately thrown open to public inspection. On the 18th of June a trial trip took place in the harbor of New York, on which occasion the members of the press, the Mayors of New York and Brooklyn, and a large company of distinguished guests were invited. The Pilgrim is a marvel of perfection and elegance in every department—a veritable floating palace. The latest achievements of science and art, so far as they are to-day practically available for improved navigation, are realized in the Pilgrim. The iron hull is made double, and has over one hundred water tight compartments. It is claimed that the vessel will not sink. The boilers are inclosed in iron apartments, and it is believed that fire cannot spread from the furnaces to other parts of the ship. The machinery is of the latest and most reliable character. Steam steering gear is employed. The illumination by electricity is of the most brilliant description, and is furnished by Edison machines. Our engraving gives a general idea of the exterior appearance of the vessel.



THE NEW STEAMER PILGRIM.—NEW YORK AND FALL RIVER LINE.

The principal dimensions of the Pilgrim are as follows: Length on deck, 390 feet; on the 11 foot load line, 375 feet; beam of the hull proper, 50 feet; beam over guards, 87 6 feet; depth of hold proper, 18·6 feet; depth from floor to top of dome, 60 feet; tonnage, about 3,500 registered tons.

Her motive power consists of a vertical beam engine, with a cylinder 110 inches in diameter, stroke of piston 14 feet working under a maximum steam pressure of 50 pounds to the square inch. She has 12 boilers made of steel, having a tensile strength of 62,000 pounds to the square inch. These boilers are in "nests" of three each, making four separate structures, developing in all 5,500 horse power. The main shafts are 26 inches in diameter in the journals; the paddle wheels are 41 feet in diameter, weighing 85 tons each without the shaft; the walking beam weighs 33 tons, the cylinder 30 tons, bed plate 30 tons, and the condenser 60 tons. The strain on the center pin of the walking beam will be 625 tons. The entire steam machinery (with water in the boilers) will weigh 1,363 tons.

The hull is built on the longitudinal bracket system throughout; that is, she is a ship within a ship, and has 103 water tight compartments. It would be impossible to sink her by staving in her bottom. Twenty-five feet from her stem is the water tight collision bulkhead, fifty feet abaft the stem is another bulkhead, and thirty feet forward of her stern is another bulkhead, all of iron.

The electrical "plant" on the Pilgrim is Edison's, and consists of 912 lamps, one "L" and two "K" dynamos, with a capacity of 11,382 candle power, and two Armington & Sims engines, one 8½ x 10 "B" engine, and one 9½ x 12 "C" engine, belted direct to the dynamos. Steam is furnished by a special boiler of 150 horse power, with 80 pounds pressure, and in case of necessity connections can be made with the main or donkey boilers. The dynamos can be used together or separately, and are regulated by the Edison automatic regulator.

The grand saloon is illuminated by one magnificent electrolier of 36 lights and two electroliers of 27 lights each, each electrolier having four tiers of lights, each tier being controlled by a separate switch, and each electrolier being supplied from two separate sections of conductors.

The dynamo room is situated in the forward part of the boat, and is 30 feet long and 40 feet wide. Each room in the boat has its individual electric light and electric call bell. The ladies' parlor is 70 feet long and the width of the boat (excepting the guards), and contains 33 staterooms and 6 alcove passage ways to the guards, each alcove having a slat blind door, so that those for whom extra beds are made up on the parlor floor are entirely inclosed from intrusion. The parlor is a most luxuriantly fitted up apartment.

The grand saloon is the largest and finest steamboat saloon in the world, being 320 feet in length. Its dome roof is 20·6 feet from the saloon deck, and is 280 feet long. The sides of the saloon are 9·3 feet high, and of the gallery 6·7 feet high. This grand apartment will hold, with its gallery balcony, her allowance of 1,400 passengers, without crowding, a gathering which would require over 23 ordinary railway cars to seat. The staterooms are models of comfort, with spring beds, the best of hair mattresses, feather pillows, and spotless bed linen, lace and damask curtains, etc. The Pilgrim belongs to the Old Colony Steamboat Company, of which Mr. Charles F. Choate is the president. Her captain is Benjamin M. Simmons. Hull and machinery built by John Roach & Company.

Combined Gas and Electrical Light.

M. Somzee has made another attempt to produce a cheap and brilliant light by the combination of gas and electricity. The arrangement comprises an ordinary gas flame, fitted with a curved metallic rod passing through the flame, provided with means for preventing overheating under the action of the electric current, which is taken from a secondary battery. It is claimed, in a notice of the arrangement given in the *Journal de l'Eclairage au Gaz*, that under these conditions the illuminating power is considerably augmented in proportion to the additional expense. The light is also said to be white, and much cooler in respect of radiation than a corresponding light from gas alone; the relative proportion of luminous and heat rays being completely changed. What is supposed to render this combination practicable is the fact that the platinum does not require a great intensity of current, and that "one or two small elements will suffice to supply an ordinary light, and make it give four or five times more light at a cost three times less than gas." These are nearly the same data of cost and illuminating power as those to which the public have been made accustomed by electricians. It is a novelty, however, to find gas introduced into the combination in this fashion. According as the intensity of the current is increased or diminished, the flame may be rendered more luminous or hotter as the case may be, so that the arrangement is "capable of furnishing all gradations, from the brilliant flame to the most calorific radiations." Here, it is evident, is a gas stove and lighthouse in one, and only needing a reliable secondary battery to be capable of use for either purpose.

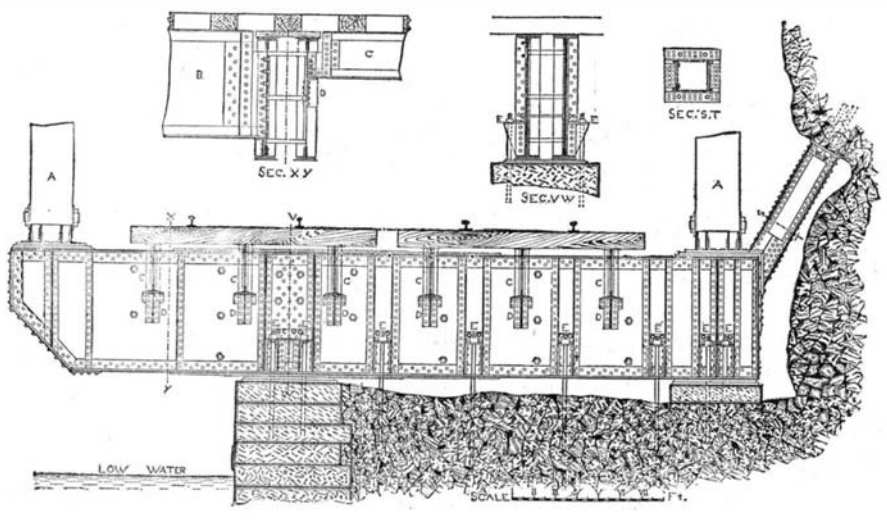
A RAILWAY BRACKET GIRDER.

On the New York, West Shore. and Buffalo Railway, at Cozzen's, the road runs along the bank of the Hudson River at an elevation of only a few feet above the surface of the water, and hills of solid rock dip into the river, forming only an insignificant shore.

The line of the road was such that excavating in the side of the hill to the distance needed was out of the question. To overcome these difficulties, says the *Railroad Gazette*, the bracket shown in the engraving was decided upon. This consists of two rigidly connected plate girders placed 1 foot 10 inches between centers and having a length of 35 feet. The web is ⅝ inch thick, stiffened with angle irons 5 by 3½ by ½ inch. The ends of this twin girder rest on masonry, as illustrated. Not quite one-third of the girder projects over the water. The trusses for the long span bridge over the bay (span, 134 feet 9 inches) rest on this girder, one at each end as indicated at A A'. The stringers, C C C, are supported on brackets, D D D, the ties being laid as shown. The cross section through X Y shows this arrangement, and also the supports for the plate girder comprising the short bridge, which is 89 feet 1⅛ inches long. There are two of these longitudinal girders placed about 8 feet apart, and upon which the outer track runs until it reaches land some 50 feet from the twin girders.

The outer support of the twin girders is so located relative to the outer track that the moving load of a train on this track is just balanced over the edge of the masonry, and does not, therefore, affect the stability of the structure. In order, however, to guard against all contingencies, the girder is secured to the rock at regular intervals by bolts 9 feet long, shown at E E E. The cross section, V W, shows the method of fastening these bolts to the girder. The bolts are held in the rock by splitting the lower ends and driving them upon feather wedges of steel, the spreading thus caused bearing firmly against the sides of the holes and preventing any liability of drawing. The holes were then carefully filled with Portland cement, and it may be stated in this connection that the spaces beneath the girders and also between them will be filled with concrete in order to exclude all water which might spray up from the river.

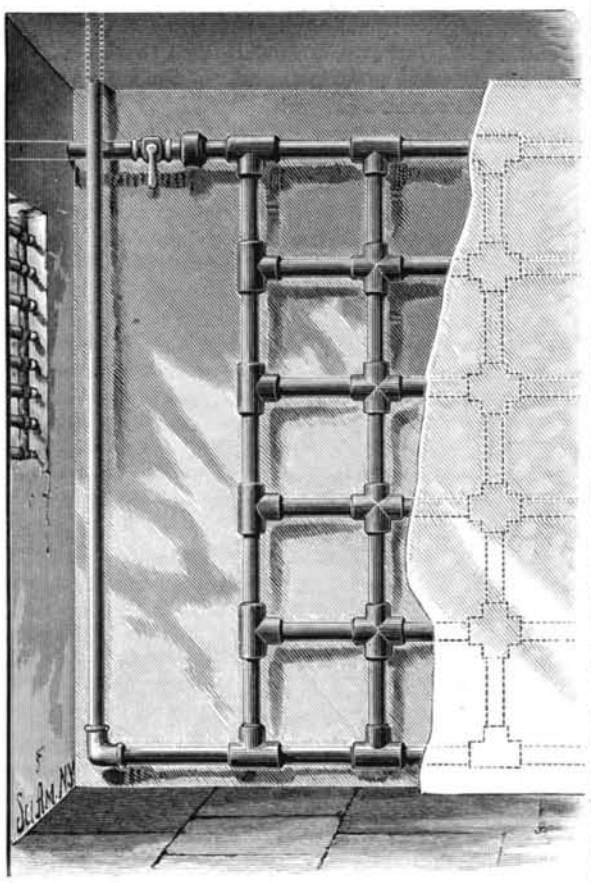
The rock has been cut away as shown at the right of the engraving and a strut inserted. This is a square column (cross section, S T), having interior dimensions of 16 by 18 inches, and exterior of 2 feet 5 inches by 2 feet 7 inches, with plates 1 inch thick. The length is 5 feet 9 inches. To make a perfect fit a slightly tapering plate was driven in at the top, after which the bolts were screwed up.



BRACKET GIRDER FOR NEW YORK WEST SHORE AND BUFFALO RAILWAY.

IMPROVED WALL FOR JAILS AND TREASURE VAULTS.

The annexed engraving shows an improvement in the construction of walls designed to prevent prisoners from escaping from jail, and to protect treasure vaults from the attack of burglars. The improvement consists in lining the wall with or incorporating in it a network of water pipes supplied by water under pressure from the city mains or other suitable supply, so that any attempt at cutting through the pipes will result in the flooding of the building, giving notice to the guard of the attempt before it can be successful. A system of water pipes forming the sides of the cell or chamber consists of pipes placed about ten inches apart, parallel to each other, and crossing each other at right angles and connected at the point of crossing by cross couplings.



McLEAN'S SAFETY WALL FOR JAILS AND TREASURE VAULTS.

This system of pipes has two or more sources of supply at the corners, and the pipes may be made to cover the side walls of the cell or chamber, the ceiling, the floor, or all of them, or it may be made simply to protect the windows as a grating. The provision thus made effectually prevents jail delivery, or the breaking into treasure vaults, as at least four pipes each of an inch diameter will have to be cut to effect a passage, and before this work can be completed the water flowing from the ones first cut would deluge the building and give notice.

For enabling the guard to know when an attempt is being made to saw through the pipes, a pressure gauge is arranged in the guard's room, which will indicate a diminution of pressure whenever the water commences to escape through a sawed pipe. In cold weather the water in the pipes can be slightly warmed, so as to avoid freezing and at the same time impart a sufficient degree of warmth to the jail. This invention has been patented by Mr. Samuel M. McLean, of Modisto, Cal.

Case Hardening.

Probably no better method of case hardening can be employed than that of packing the article to be hardened in a box or crucible with the carbonizing materials — ground bone or animal charcoal—luting the vessel tight, and exposing it for several hours to a red heat. In large establishments where case hardening is a daily duty ovens and special appliances are always at hand. But when there is only one piece to be treated, and the necessity for case hardening occurs only occasionally, a simpler method may serve. It is well to keep on hand, for this purpose, a powdered mixture of prussiate of potash and bone black or animal charcoal, in equal proportions by quantity. This may be applied to the red hot iron, either as a powder, or as a paste made with oil or even mixed with water.

ASTORIA, Oregon, is making very rapid progress. It has 24 salmon packing concerns within its limits, employing 5,000 people.

Baldness.

In an article recently contributed to the *Gesundheit*—a paper, as its name imports, devoted to sanitary subjects—Professor Reclam, a German *Gelehrter*, makes some timely and useful observations on the subject of baldness. After describing, in a vein of pleasantry, the vast array of bare polls which may be seen any evening in the pit of a theater or the body of a lecture-room, he discusses the causes of baldness. He does not think, as is sometimes said, that loss of hair is the result either of impaired health or of much study. The strongest men are often bareheaded, and German professors, who are nothing if not studious, are distinguished above all men by the profusion of their locks. On the other hand, soldiers and postilions, who wear heavy helmets and leather caps, and wear them a good deal, are frequently as bald as billiard balls. From these facts Herr Reclam draws the conclusion that baldness comes chiefly of the artificial determination of blood to the head, and to the heat and perspiration thence arising. The result is a relaxed condition of the scalp and loss of hair. If the skin of the head be kept in a healthy state, contends the professor, the hair will not fall off. To keep it healthy, the head-covering should be light and porous, the head kept clean by washings with water, and the hair cut short. The nostrums vended as hair restorers, and on which a fabulous amount of money is wasted by the ignorant for the benefit of quacks, he denounced as worse than useless. In ninety-nine cases out of a hundred they are worse than useless. Cleanliness and cold water are the sole trustworthy specifics; but when once the hair roots are destroyed, not all the oil of Macassar, the bear's grease of Siberia, nor the cantharides of Spain will woo back the vanished locks.

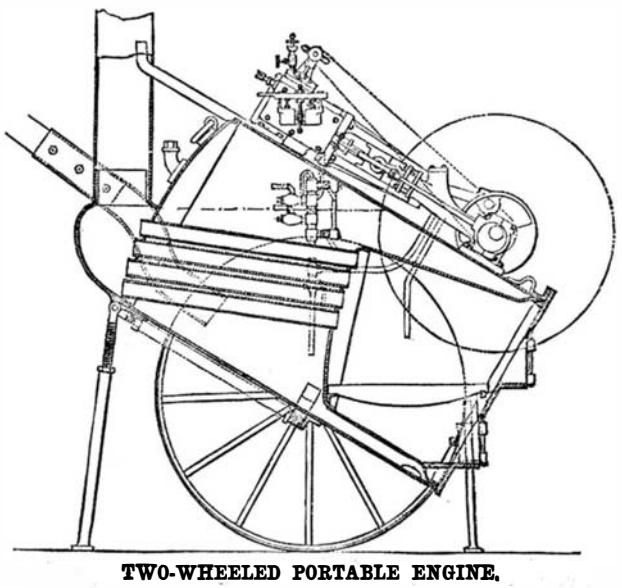
Without a Rival.

The SCIENTIFIC AMERICAN, published by Munn & Co., New York city, is without a rival as a scientific paper, and to mechanics it is simply invaluable. Thus says the Glasgow, Ky., *Weekly Times*, to which it adds: We honestly believe any mechanic would derive information from a year's reading of the SCIENTIFIC AMERICAN which any amount of money could not buy elsewhere. Some of our enterprising mechanics, we hope, the editor adds, will try the experiment of reading this really valuable and practical journal one year, and they would never give it up.

Good advice, Mr. *Times*, and now, at the commencement of a new volume, which begins next week, is a good time for not only your citizens, but for lovers of science, practical mechanics, and others throughout the land who are not already subscribers to commence taking the paper.

TWO WHEELED PORTABLE ENGINE.

The illustration shows the engine by Mr. E. S. Hindley, in the position it occupies when at work, the two shafts being raised in the air out of the way, and the engine being fixed by means of the three adjustable stays shown, these holding it firmly. Under these conditions the boiler occupies, as will be seen, a diagonal position, the tubes rising slightly toward the smokebox, and the firebars being horizontal. The water line is shown by the dotted line, from which it will be seen that the tubes are entirely covered by water. This arrangement of boiler has the advantage, says *Engineering*, of being free from any flat heating surface on which deposit can lodge, while it also affords facilities for the collection of mud, etc., below the firebox, where it can be readily blown off or cleaned out. What would in an ordinary vertical boiler be the bottom of the firebox is closed by a neat casting fitted with firehole and ashpit doors, as shown. The gauge glass fittings and gauge cock are fitted to the side of the boiler, as indicated in dotted lines.



TWO-WHEELED PORTABLE ENGINE.

The engine, which is complete in itself—it having a cast-iron bed plate taking all strains due to working—is mounted diagonally on the top of the boiler as shown, the cylinder casting containing the stop valve and also carrying the two safety valves as illustrated. The whole design is neatly worked out.

The engine is mounted on two large wrought iron wheels, which enable it to be readily transported over rough roads, while it is, of course, very handy to turn and shift about in a limited space.

MANUFACTURE OF ELECTRIC LAMPS.

(*Continued from first page.*)

means of a hand-wheel, rack, and pinion. The machine is also supplied with a blow-pipe attached to a sliding saddle and suitable valves actuated by a treadle, *k*, for the admission of air to the mandrels.

The operation of blowing the bulbs is as follows: The boy takes a piece of glass tube nine inches long and three-fourths inch in diameter, and having griped each end in the chuck provided on the mandrels, starts the machine and brings the flame of the blow-pipe to bear upon the middle of the length of tube, which, being softened, is drawn out into a small tube, thus forming two "pump stems." The flame is then made to play on the original tube between its extreme end and the drawn-out "pump stem." This part being softened, is blown out to the shape required, and the operation is repeated at the other end of the tube, thereby making two bulbs from the single tube. The admission of the air, the direction and force of the blow-pipe, the approach and recession of the mandrels, so as to lengthen or shorten the bulb, are movements all readily controlled by the boy operator, who is able on an average to model from 250 to 300 bulbs complete per diem. By a succession of somewhat similar processes the whole of the glasswork in the incandescent lamp is finished. A boy blows the bulb, a boy fixes the two platinum electrodes by a bead of glass, and a boy inserts the mounted filament into the end of the finished bulb, thus preparing the lamp for pumping and sealing off, which is done upstairs.

The preparation of the filaments is carried on in an upper room, Fig. 2. Almost any kind of tough vegetable fiber will serve, the inventor having a special process for densifying and giving it a metallic luster. The fiber actually employed appears to be a species of grass, not unlike the coarse, wiry specimen which often grows by the seaside. A length of this grass is bent by a boy round a metal mould into the proper helical form, Fig. 3. The fibers on their moulds are then gently heated, thereby fixing their shape. The filaments thus formed are afterward placed in a crucible, filled up with plumbago, from whence they are transferred to a Fletcher furnace, where they are exposed to great heat. This carbonizes them, and they are then sent into the mounting room, where they are fixed, as shown in Fig. 4, upon the platinum electrodes which have been prepared for them. The mounting is a secret process, but it mainly consists in sticking the filament ends into the hollow of the small spirals turned on the upper ends of the platinum electrodes, and cementing them with a special cement. The filaments thus mounted are then "flashed" in a special liquid, which forms and deposits carbon in their pores, creating, it is claimed, a dense elastic carbon having a bright metallic luster.

The proper resistance is first estimated by the light given out by other lamps in circuit with the filaments and checked by a Wheatstone bridge. Thus finished off, the mounted filaments are then taken down to the glass blowing room, where they are inserted in the bulbs, and sealed as shown in Fig. 8. The lamp is next taken to the pumping room, Fig. 10, where there are a series of mechanical mercury pumps, each capable of exhausting twelve lamps at a time. For this work only two men are employed, for by setting the lamps in groups in different stages of exhaustion, one man can attend to the exhaustion of a large number of lamps, sealing off the completed lamps and supplying fresh ones, as the pump continues to act of itself. A clear view of the pumps and the exhausting frames is given in the engraving. The mercury reservoirs are raised and lowered automatically by straps from power shafting, and the velocity of movement is adjusted by means of a half moon pulley, which allows the reservoir to move slowly at the beginning and end of its up and down range. The lamps are attached to spiral springs, which pull them upward as they are sealed off, and thus facilitate the act of sealing. The power shafting carrying the half moon pulleys lifts the mercury reservoirs and lets them down by a rope connected with the pulleys. An India-rubber tube connects the pump vessel with the mercury reservoir. The lamps are supported on short upright tubes or stems to undergo exhaustion.

The mercury pump is an improvement devised by Messrs. Wright and Mackie on the ordinary Geissler pump, and obviates the necessity of taking out a stopper to let the air escape. The valves of the air pump are, in fact, automatic also, and thus the entire arrangement is self-acting. The degree of exhaustion can be estimated by the height of the mercury column, and is from one-millionth to one and a half millionth of an atmosphere. The whole of the work of the factory is regulated by piecework, and it is stated that by the means described the manufacture of incandescent lamps is very greatly reduced in cost, and the rate of production increased.

It seems remarkable that the primitive practice of blowing glass by the mere aid of human lungs has not long ago been superseded by a directly mechanical method. The progress of electric lighting has at length applied a stimulus which will evidently terminate the rude and unsatisfactory operations of the human glass-blower. The electric light in the incandescent form has created a demand for a species of lamp which makes a heavy call on the resources of the glass-blowing workshops. The time has arrived when machinery is absolutely required to supersede the tedious and clumsy system hitherto adopted, and it is eminently satisfactory to find that inventive genius has already achieved success in this direction. The mechanical glass-blower is also capable of being applied to other processes besides that which we have thus described.

The *Engineer*, to which we are indebted for our particulars, says that, independently of the glass-blowing invention, the Wright and Mackie lamp is itself a success. The filament is said to be remarkably durable, and capable of bearing a strong current. Experiments which we have seen in proof of this have been satisfactory. The carbon filaments on that occasion were obtained from the leaf-stalks of the cocoa-nut palm.

Trial of a Compressed Air Car.

The direct application of compressed air to the driving of tramcars was successfully demonstrated lately in London to a large party of gentlemen interested in such matters, by the British Mekarski Air Engine Company. The Mekarski engine is no novelty as an independent engine, in which form it has already done good work in tramway hauling in this country. It is, however, as combined with a tramcar that it is new in England, although in this form it has been working tramway traffic successfully at Nantes, in France, for the last four years. The engine house is situate at the depot of the London Street Tramways Company in the Camden road, Holloway, and contains two 20 horse power engines, with compressing cylinders, air receivers, and store tanks for a reserve of compressed air at a pressure of 450 pounds per square inch; steam being supplied to the compressing engines by two double flued Lancashire boilers. The car is one of the ordinary cars of the London Street Tramways Company (who are the first to adopt the system) adapted for working on the Mekarski principle. The car has two pairs of wheels, one pair being used for driving and being connected with the working cylinders, which are 5½ inches in diameter, with a 10 inch stroke, and in which the compressed air is used. This air is stored in a reservoir placed under the body of the car, and in passing thence to the cylinders it is conducted through boiling water and steam at 60 pounds per square inch, carried in a vessel called a hot pot. This vessel is charged at the depot during the time occupied in charging the reservoir on the car with compressed air. This application of heat not only causes an expansion of the air, but prevents the formation of snow in the cylinders and at the exhaust. The moisture picked up also acts as a lubricant for the slide valves and pistons of the driving engines. The working pressure varies from 120 pounds down to 50 pounds per square inch, the variation being regulated by a special valve which gives the driver a means of minutely adjusting the pressure, and of perfectly controlling the engine, and consequently the vehicle. A hot pot is placed at each end of the car, on the platform, and the driver and conductor have at present to change ends at the close of each run. By adopting a triangle at each end of the line, however, the cars in future will be reversed, so that in adapting the other cars of the company, as is intended, a hot pot will be placed at one end only, and thus expense will be saved. The car is fitted with the ordinary driver's foot brake, besides which there is a powerful air pressure brake for use in emergencies, which will bring the car up in a distance slightly exceeding its own length. No noise whatever is made by the exhaust air from the engines, nor is there any steam visible, nor the smell of fire or engine lubricants. The car runs smoothly and well, as was demonstrated at the trial which was made upon the company's line, which runs the whole length of the Caledonian road, between Holloway road and King's Cross. The length is two miles, and it has several steep gradients and sharp curves on its course. The journey to King's Cross and back was accomplished in excellent time, and was in other respects a success. It is intended to fit the remaining cars on this line upon the Mekarski principle, and so by degrees to supersede the present horse traction.—*London Times.*

Toughened Glass for Brewery Utensils.

On account of its comparative cheapness, the ease with which it is worked, and its elastic and unbreakable nature, wood continues to be the material of which brewery utensils are most generally made. There are, however, says the *Brewers' Guardian*, many and very grave objections to wood; it is very liable to decay, and its greatest drawback is that it is very porous, and thus not only absorbs some of the wort and beer, but its pores, cracks, and fissures form resting places for the innumerable minute organisms which are always present in wort and beer, and which there propagate and develop to an alarming extent, and are not easily detached or destroyed by any mechanical means or chemical agents. Brewers have therefore, occasionally, endeavored to replace wood by some more suitable material; stone is used sometimes in the north of England; slate, in spite of its first cost, which is considerable, is fast growing into favor, and glass has also been recommended. The objections to glass are its expense, the difficulty of obtaining it in sufficiently large sheets of the requisite strength, and its excessive liability to fracture. We have lately seen advertised a material called "toughened glass," and such a material would seem to lend itself to the requirements of the brewer; if large sheets of it cannot be obtained at a moderate expense, tablets of a moderate size might be glazed together in a suitable framework by means of some insoluble and odorless cement. Fermenting squares, racking vats, yeast stillions, and other utensils made of such a material would seem to meet all the requirements of the brewer, and would certainly be preferable to any other material, with the exception perhaps of slate, in the matter of cleanliness.

Correspondence.

The Gospel Trumpet.

To the Editor of the Scientific American:

You publish, on page 373, an article and illustration, "Making the Deaf to Hear." In the Presbyterian church here has been a "gospel trumpet" since 1873, which is entirely concealed and works as well as that shown. The tunnel is in the front of the pulpit desk, in the cushion, and runs down under the floor, with branches to several different pews, ending in flexible tubes which coil up in the ends of the pews when not in use, which tubes terminate in hard rubber ear pieces for placing in the ear. The same arrangement was originally a number of years in the old Presbyterian church, now torn down. The apparatus I believe was invented by a man in New Brunswick, N. J., who was paid a royalty for use in said church.

It gives good satisfaction, and the sittings are often borrowed for the old and feeble.

CHAS. F. RICHARDSON.

Freehold, N. J., June 15, 1883.

DECISIONS RELATING TO PATENTS.

By the Commissioner of Patents.

STARR AND PEYTON *vs.* FARMER.—ELECTRIC LIGHT.

In the interference between the application of Moses G. Farmer, filed October 11, 1881, and the application of Starr and Peyton, filed January 9, 1882, *Held* that, Starr and Peyton having failed to show any invention prior to the time when Farmer had matured his right to the patent by duly filing an application in the United States Patent Office in accordance with the law, Farmer is adjudged the prior inventor.

When an inventor has duly filed an application for a patent, exhibiting by means of drawings, models, and written descriptions the nature and scope of a hitherto unknown invention, and has made oath that the said invention is original with himself, and that to the best of his knowledge and belief he is the first inventor thereof, he has perfected his right to a patent, and one who would then seek to arrest the issue of such patent on the ground that he has a prior right to the invention must show that he had before that time matured his right to the invention, or that he had before that time an inchoate right, which has since been perfected, so as to relate back to a time anterior to such application.

The filing of an application under the formalities prescribed by the patent law is in itself visible proof of the existence of the things or inventions therein shown and described, and when accompanied by the oath that the applicant is the true and original inventor of such invention or discovery is *prima facie* proof that such applicant is entitled to a patent for such invention.

It is not a valid defense to a patent granted in compliance with the forms of law to show that the invention has never been reduced to practice.

Scale of Hardness for Metals.

Gollner gives the following numerical scale for the hardness of metals, ranging over 18 degrees:

Pure soft lead	1.
Pure tin	2.
Pure hard lead	3.
Soft tempered copper	4.
Pure soft copper (cast)	5.
Soft Babbitt metal (having copper 85, tin 10, zinc 5)	6.
Tempered cast iron	7.
Fibrous wrought iron	8.
Fine grained, light gray cast iron	9.
Strengthened cast iron (0·1 turnings)	10.
Soft iron (with 0·15 of carbon)	11.
Untempered steel (with 0·45 carbon)	12.
" " (with 0·96 carbon)	13.
Crucible steel, tempered and drawn to blue	14.
" " " drawn violet or orange	15.
" " " drawn straw color	16.
Hard bronze for bearings	17.
Cast crucible steel of glassy hardness	18.

Pointed cylinders are made from each of the metals of this scale, and these points are used for testing the hardness of other metals. In making the trial they are weighted with 11 pounds for example, and drawn over the polished surface of the other metal a certain number of times, say six.—*Techn. Blaetter.*

An Athletic Electrician.

Mr. Hiram S. Maxim, of New York, the well known electrician, was robbed by two thieves on a night train near Dieppe, France, in 1881. Mr. Maxim has kept a lookout for the robbers, and on the evening of June 5 he discovered them at Rouen. One of them escaped on an outgoing train, but Mr. Maxim chased and caught the other as he was about to board the moving train. Together the struggling men were carried into a tunnel, Mr. Maxim clinging with one arm to the car, his hand through a window, and holding the thief with the other hand. The struggle attracted attention, the train was stopped, and Mr. Maxim took his prisoner to the station and delivered him to the authorities. Mr. Maxim said: "On the way to the police station the prisoner conversed freely with me, and said that if I would refrain from accusing him he would refund my money and pay all expenses I had been put to. I told him that it was not a question of money with me, but a matter of principle. Upon being taken before the Chief of Police he pleaded guilty, and will probably soon be brought to Paris for sentence."

Cocoa and Chocolate.

M. Boussingault, a member of the French Institute, contributes an interesting paper on cocoa and chocolate to the *Annales de Physique et de Chimie*, of which the following forms a part.

The cocoa tree flourishes in the warm countries of America, but at the time of the conquest it was cultivated only in Mexico, Guatemala, and Nicaragua, where the inhabitants were of Toltec and Aztec origin. It was from these localities, under the reign of Montezuma, that the Spaniards transplanted this tree to the shores of the Canaries and the Philippine Islands, and thence to Venezuela and into the Antilles. A drink called "chocolatl," which was in general use there, was made from the seeds of the fruit reduced to a paste.

It is a fact well known to planters that it is necessary, as far as possible, to plant the cocoa tree on a virgin soil; a blunder has frequently been committed by doing otherwise. This tree requires a rich, deep, and moist soil, and warm weather. Nothing is more inviting than a cleared forest, having a slope that permits of irrigation. But all the important plantations present a common aspect; they are met with in warm, sheltered regions, at a short distance from the sea, or near a torrent on the banks of a river. The cultivation of the cocoa tree ceases to be profitable when the mean temperature falls to 24° C. (75° Fahr.).

The tree rarely blooms before the age of thirty months. The planters pluck these first flowers and do not let them bear fruit until the fourth year, and that under the most favorable climatic influence, when the mean temperature is from 27° to 28° C. (80° to 82° Fahr.).

The blossom is very small, and out of all proportion to the size of the fruit. I measured one bud that was only 4 mm. (one-sixth inch) long. The flesh colored corolla had ten petals surrounding five stamens of a silver whiteness. They are not isolated, but collected in bouquets, surrounding the trunk at all heights, and on the principal branches; they are even seen on the woody roots that creep on the surface of the ground. The interval from the time the flowers fall until the fruit matures is about four months. The fruit is long and slightly curved, being divided into five lobes. Its length is nearly ten inches, its greatest diameter near the point of attachment is three to four inches, and it weighs ten to sixteen ounces. The color varies from greenish white to a reddish violet; the pericarp is furrowed by longitudinal ribs. Within the flesh or pulp is white, pink, and tart; it usually contains twenty-five kernels, which are white and oily, and when dry have a brown color on the surface. There are two principal harvests in a year, but in a large grove they are gathered every day, and it is not uncommon to see a tree bearing both flowers and fruit at the same time. After breaking the shell the seeds are removed with a piece of wood rounded at one end, and then exposed to the sun; in the evening they are collected in a heap under a shed. It is manifest that an active fermentation is going on which would prove injurious if allowed to increase, because the fresh cocoa when heaped up heats very much; so in the morning they are spread out again in the air.

The cultivation of the cocoa tree requires but few men, for one man can take care of a thousand trees. What they dread the most are the sudden changes, even in favorable weather; if there comes a shower, the fruit falls off, but the principal occupation of the majordomo is to defend the fruit against ravages of animals (monkeys, deer, and parrots).

The genus of the cocoa (*Theobroma*) belongs to the family of the *Butyriaceæ;* it embraces several species, the most important of which is the *Theobroma cacao*, the characters of which vary according to the province.

Cocoa is decorticated by roasting at a gentle heat. In the roasting operation this bean, like the coffee, acquires a peculiar odor due to an infinitesimal quantity of a volatile principle. To this the chocolate owes its aroma.

The cocoa-bean is rich in nutritive principles; besides a large quantity of fatty-like butter, it contains nitrogenous substances like albumen and caseine, also theobromine, and compounds of ternary character. These constituents necessarily vary in quantity with the source.

The decorticated beans, when deprived of the germ, contain, according to M. L'Hote, in one hundred parts:

Province	Water.	Butter.	Ash.	N.	Albumen.
Guayaquil	6·50	40·10	3·75	2·38	14·9
Martinique	7·50	41·20	2·75	2·25	14·5
Guayra	7·00	35·96	4·00	2·18	13 6
Maraguan (roasted)	4·20	45·80	2·75	2·22	13·7
Caraque	4·20	51·50	40·0	2·16	13·5

(The albumen is calculated from the nitrogen in excess of that in the theobromine, the former containing sixteen per cent, the latter thirty-one per cent of nitrogen.)

The cocoa bean, cleaned but not roasted, contains in one hundred parts:

	Payen.	Mitscherlich.	Boussingault.
Butter	48 to 50	45 to 49	53·3
Albumen	21 to 20	13 to 18	12·9
Theobromine	4 to 3	1·2 to 1·5	2·4
Starch and glucose	11 to 10	14 to 18	6·7
Cellulose	3 to 2	6·0	9·1
Mineral subst	3 to 4	3·5	4·0
Water	10 to 12	6·3	11·6
	100—100	92·6	100

Analyses show that the principles contained in the seeds of the cocoa are as follows:

Fatty matter, butter, albumen, theobromine, starch, glucose, gum, cellulose, tartaric acid free or combined, tannin, mineral substances (phosphoric acid, potash, lime, magnesia, silica, traces of iron).

Cocoa beans, when decorticated, slightly roasted, and separated from the germs by culling, are the base of chocolate, the use of which is so widespread at the present day. It is not necessary to describe its preparation. Suffice it to say that it is obtained by grinding between cylinders kept at a certain temperature a mixture of cocoa beans from different sources of the aromatic varieties, and more or less unctuous. When the mass is sufficiently softened, sugar is gradually introduced in such a manner as to maintain the softness of the material. The grinding is accomplished by means of cylinders or cones revolving at different velocities on a granite platform; the paste is then made to fall into tin moulds.

The sugar added to the cocoa increases the nutritive quality of the mixture; it is evidently one of the most prompt reparative aliments.

The Mexicans prepare a *pâte* of cocoa which they call *chocolatl*, in which they put a little corn flour, some vanilla, and allspice.

P. Gili asserts, on the authority of a passage in the *Monarquia Indiana*, published by Torquemada, that the Aztecs made the infusion of chocolatl with cold water.

Even in the sixteenth century travelers differed greatly in their opinions regarding this substance.

Acosta thought its value had been overestimated. Humboldt remarked that this opinion reminded him of the prediction made about the use of coffee. On the other hand, Fernando Cortes perhaps exaggerated its value; after drinking a cup of it he wrote that a person could make a journey without any other nourishment. Nevertheless, I will admit that in an expedition to a great distance, where it is imperatively necessary to reduce the weight of the rations, chocolate offers undeniable advantages, as I have frequently had occasion to notice.

In France the new beverage had its partisans and enemies. It is known that Mme. De Sevigne, in a letter addressed to her daughter, said: "I have been trying to accustom myself to the use of chocolate; day before yesterday I took it to help digest my dinner, and at the end of a good supper, and yesterday I took it for nourishment, so as to enable me to fast till evening, and it accomplished everything I desired, and besides that I found it agreeable, and it acts as intended."

Chocolate possesses one essential quality in that it contains a very large proportion of nutritive matter in a small volume. Humboldt recalls what has been said with reason, that in Africa rice, gum, and butter enable men to cross the desert; he adds that in the New World chocolate and corn meal render the plateaus of the Andes and the vast uninhabited forests accessible to man.

The manufacture of chocolate has made great progress in Europe. In examining the products of the principal establishments we arrive at this conclusion—that, when properly prepared, chocolate contains nothing but cocoa and sugar.

(The author here gives analyses made in the Conservatoire des Arts et Metiers of the different chocolates made in Paris and in Spain.) It is well known that the amount of sugar varies.

The cocoas of Soconusco and Caracas are the most highly esteemed; that of Guayaquil is much in demand on account of its lower price and good quality when carefully preserved.

The development of the chocolate industry in France can be seen in a document of M. Marie, which shows that the importation in 1860 was 10,354,517 lb., and in 1881 it had reached 26,798,745.

In its combination of albumen, fat, and sugar and the presence of phosphates, cocoa and chocolate resemble milk, the type, according to Proust, of the whole diet that nourishes and sustains man.

The emulsion of chocolate necessarily varies in consistence according to the volume of water used in preparing it. They generally take five times the weight of the chocolate, and that is the proportion used for assay.

Hence 579 grains of the cake chocolate would yield 3,420 grains of emulsion, in which are contained:

Albumen	30 grains.
Butter	140 "
Sugar	320 "
Salts, phosphates, etc	10 "
	500

In 3,420 grains of cow's milk there are contained:

Albumen	136 grains.
Butter	150 "
Milk sugar	150 "
Salts, phosphates, etc	27 "
	463

It will be seen that milk is richer in nitrogenous matter; it contains less sugar, and butter in the same proportion.

A chocolate in which there is less sugar gives a beverage that approaches milk in composition.

In all the chocolates analyzed the weight of the sugar was equal to and sometimes greater than that of the cocoa.

The large proportion of sugar necessarily diminishes the nutritive value of the products. But in Central America, when they organize a river expedition or traverse the forests, they prepare chocolate for provision with eighty parts of cocoa to twenty of coarse sugar, the composition being as follows:

Sugar	200
Butter	410
Albumen	100
Phosphates and salts	30
Other matter	260
	1000

Each man receives sixty grammes (two oz.) of this chocolate per day, in which there are twelve grammes of sugar, twenty-six grammes of butter, and six of albumen.

It is a useful addition to the ration formed of beef slightly salted and dried in the air (*tasajo*), of rice, of corn biscuit, or of cassava muffins.

We will close with certain remarks made about chocolate at the International Exhibition of Great Britain.

It has been remarked that when man reaches a certain state of civilization he frequently associates with the vegetable food that sustains him some fermented beverage. Wine taken in proper quantity favors the digestion of these aliments, excites the memory, exalts the imagination, and develops a sentiment of ease and comfort without giving rise to that grievous reaction frequently occasioned by the abuse of alcoholic liquors.

It is a curious fact that different races of men separated by long distances and *never* having had any communication with each other, prepare stimulating drinks from certain plants—tea in China, mate in Paraguay, cocoa in Mexico, and coca in Peru; using at one time the leaves, at another the seeds of plants that have no botanical resemblance, but, in spite of this difference, exert the same effect upon the nervous system and on digestion. In fact, there are substances in these plants that have the constitution of alkaloids and are endowed with similar properties.

In the leaves of tea and of mate and in the seeds of coffee it is caffeine; in the leaves of coca is is coceine; and in the seeds of cocoa it is theobromine. But the Chinese, the Arabs, the Indians of Paraguay, the Incas, and the Aztecs were all under the influence of the same agent when they took their habitual drink, which custom is so widespread among all nations.

The infusions of tea, mate, coffee, and coca are not, of course, to be considered as food. The amount of solid matter in them is very slight, and their effects are due only to their alkaloids.

This is not true of chocolate, which is at the same time a complete food and an active excitant, since it approaches in composition that model food, the milk. In fact, we have seen that in cocoa there is some leguminous, some albumen, associated with fat, a mylaceous matter, and sugar to sustain respiratory combustion, and finally phosphates, which are the basis of the bones, and then—what milk does not have—theobromine and a delicate aroma. Roasted, ground, and mixed with sugar, cocoa becomes chocolate, the nutritive properties of which astonished the Spanish soldier that invaded Mexico.

Varnish for Foundry Patterns and Machinery.

A varnish has been patented in Germany for the above purpose, which, it is claimed, (we do not know how justly), dries as soon as put on, gives the patterns a smooth surface, thus insuring an easy slip out of the mould, and which prevents the pattern from warping, shrinking, or swelling, and is quite impervious to moisture. This varnish is prepared in the following manner: 30 lb. of shellac, 10 lb. Manila copal, and 10 lb. of Zanzibar copal are placed in a vessel, which is heated externally by steam, and stirred during four to six hours, after which 150 parts of the finest potato spirit are added, and the whole heated during four hours to 87° C. This liquid is dyed by the addition of orange color, and can then be used for painting the patterns. When used for painting and glazing machinery, it consists of 35 lb. of shellac, 5 lb. of Manila copal, 10 lb. of Zanzibar copal, and 150 lb. of spirit.

Purification of Petroleum Benzin.

The disagreeable odor of petroleum benzin is, according to the experiments of Fred. Grazer, not removed by percolation through wood or animal charcoal, or by treatment with carbonate of sodium or lead carbonate. Agitation with potassium plumbate removed a portion of the odor, but satisfactory results were obtained by using two ounces of potassium bichromate, twelve ounces of water and three ounces of sulphuric acid, and when cool agitating with this a pint of benzin; finally, washing with water, is necessary. A very useful method for disguising the remaining odor is to shake the product with a portion of cologne water and setting aside for two or three weeks, when it may be decanted; the odor of the perfume will predominate.—*Proc. Cal. Phar. Soc.*

Scintillation of Stars.

M. Ch. Montigny, observing for many years at Brussels, has noticed, as previous observers have done, that the scintillation of stars is much increased during the occurrence of an aurora. He has noticed, further, that every aurora produces immediately its effects upon the scintillation, that stars in the north are most affected, and that the influence of the phenomenon is most marked for the stars which are observed across the upper regions of the air. Magnetic disturbances also, even when accompanied by no aurora visible at Brussels, increase the scintillation to a marked extent. On two occasions during July, 1881, the effect of magnetic disturbances was observed with no aurora visible in Brussels, or even, so far as can be learned, in any part of Denmark.—*Comptes Rendus*.

Cementing Belts.

An ordinary cement for leather belting is wheat flour boiled in oil of turpentine; but the ends must be secured by rivets or it is not reliable. The *Milling World* is our authority for saying that a better cement is made by soaking six ounces best glue in one pint of ale, then boil, add one and a half ounces of boiled linseed oil, and stir well. Another prescription is to take dissolved glue in the form as the cabinet makers use it, and add tannic acid till creamy and ropy. Make the leather surfaces to be united rough, apply the cement hot, let it cool and dry under pressure, and it will not need riveting.

For rubber belting, take pure rubber in thin slices, two ounces, dissolve in one pound bisulphide of carbon; this is a good cement, but if kept thickens very soon. In order to prevent this, add a solution of pure rubber, resin, and oil of turpentine, made thus: Melt one ounce of rubber, add half an ounce of powdered resin; when melted, add gradually three or four ounces of turpentine and stir well. When the two solutions are united, the hardening of the compound is prevented, and a cement obtained especially adapted for gluing rubber surfaces together.

Zinc Coating for Iron.

Attention has recently again been drawn to MM. Neugean and Delaite's process of protecting iron surfaces against rust. A very fine powder of metallic zinc is mixed with oil and a siccative, and applied to the iron by means of an ordinary brush. In many cases one coat is sufficient; two coats are at any rate guaranteed to secure a protection against the corrosive action of the atmosphere as well as of sea water. The zinc coating gives the iron a steel gray appearance, and it does not interfere with subsequent painting. MM. Neugean and Delaite received a diploma at the Paris Electric Exhibition of 1881, and now recommend their process for iron structures, bridges, lamp posts, etc., and also for iron ships. If this process really affords the protection it claims, nothing need be said in recommendation of it, since it can hardly be surpassed in simplicity and cheapness, and is capable of application in cases where galvanizing, the Bower-Barffe, and similar processes, would hardly be practicable. A good mixture, of which only the necessary quantity ought to be prepared, consists of 8 parts by weight of zinc, 71 of oil, and 2 of a siccative.

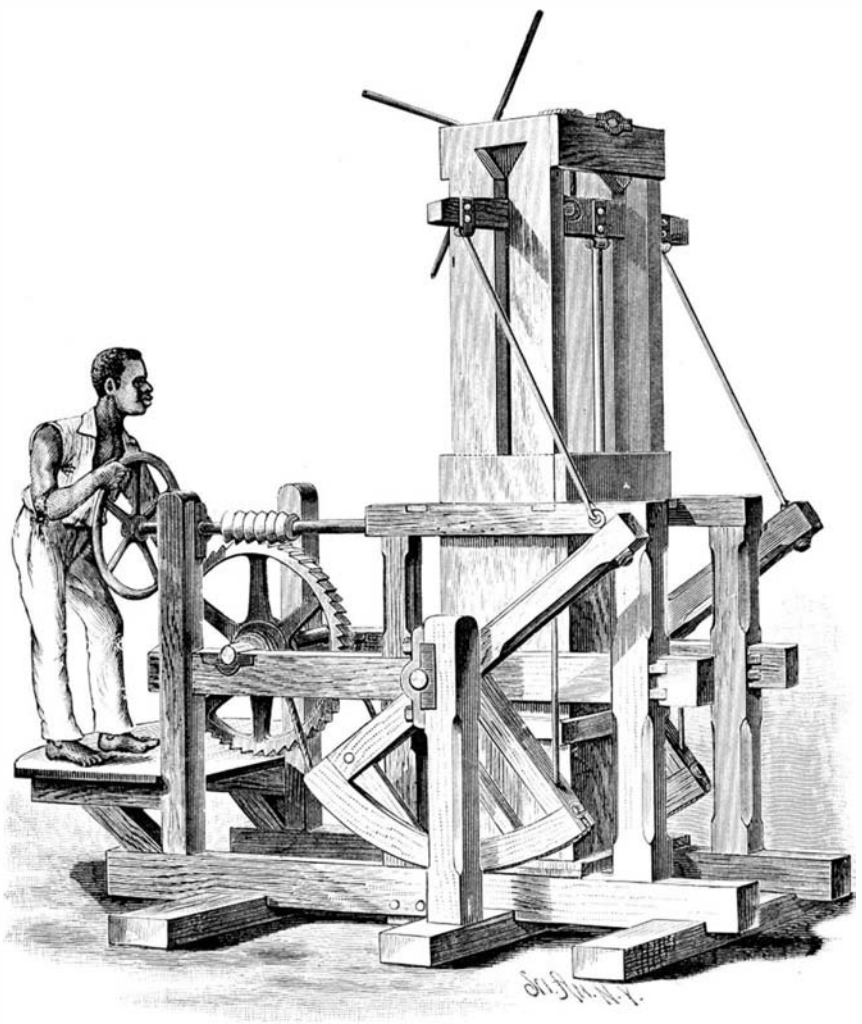
IMPROVED COTTON PRESS.

This a simple, cheap, and efficient device for working a cotton press by hand or power. The novel features consist essentially of a pair of rock levers located at the sides of a vertical case to work the follower, the power being applied to them from a windlass by ropes working on segmental rims on the levers. This construction maintains uniformity of leverage, while the connection between the levers and the follower is such as to increase the leverage as the resistance increases.

The case is vertical, and the top of the front and back sides terminate a little above the top of the main frame, while the other sides extend farther up to serve for guides to the bar of the follower, this bar being connected to the follower by rods so that the follower may be swung away from over the case, to allow the case to be filled. The follower is suspended by a cord from a small windlass at the top of the press. The cross bar of the follower is connected at each end by a rod with one end of a rock lever which is pivoted in the frame, and has a segmental rim to which a working cord or band is attached. This cord is connected to a windlass shaft journaled in the main frame, and to which the power is applied by the worm wheel, worm, and hand wheel. The shaft of the rock lever extends from side to side of the press, and has both of the working levers connected to it for working them alike.

The doors for opening the case at the lower end for the discharge of the pressed bales are pivoted to the bed frame, and secured, when shut, by bars. While the leverage of the power as applied by the ropes is uniform, that of the levers on the follower increases as the resistance increases by the varying angle of the rods with the centers of the rock levers, thus enabling great pressure to be applied to the bales by means of hand power.

The construction of the press is such that with the exception of a few bolts and rods it can be made of wood by an ordinary mechanic. This invention has been patented by Mr. William B. Ingram. For further particulars address Cox & Ingram, Lilesville, N. C.



INGRAM'S COTTON PRESS.

MR. SAMUEL E. NUTTING, of Iron Ridge, Wis., is the patentee of an improved seal lock, which is so constructed that the locking bolt may secure the door of the car. A thin metal strip or wire passes through slots in the hasp, and through the locking bolt and the hollow cylinder, holding them all securely in place. The ordinary seal with the name of the station or other device stamped thereon is used.

IMPROVEMENT IN LANTERNS.

The improved lantern shown in the engraving has been patented by Mr. G. F. Fisher, of St. John, New Brunswick.

The object of the invention is to facilitate lighting the lantern, and to render it more durable.

A cylindrical cap, open at the bottom, is held by the funnel tube connecting with the side tubes of a lantern in such a manner that the upper end of the glass globe can readily pass within the cap. The cap is provided on one side with a longitudinal slot through which projects the upper free end of a spring which is fastened to one of the side tubes.

FISHER'S IMPROVED LANTERN.

The spring strip is provided at its upper end with two prongs projecting toward the interior of the cap. The globe is provided at the upper end with an annular bead or ridge, and rests at the bottom on a perforated circular metal plate in the usual manner. When the globe is lowered, the lower prong of the spring rests upon its upper edge and holds it in place. When the lantern is to be lighted, the upper end of the spring strip is withdrawn from the cap, when the globe then can be raised sufficiently to permit passing a match between the lower edge of the globe and the plate to the burner. The globe can be held in a raised position by releasing the spring when the ridge or bead is above the prongs of the spring. As the spring is fastened to the tube in such a manner that it will not be affected by the heat, the lantern is made much more durable than the tubular lanterns of the usual construction, in which the globe holding spring is above the globe, exposed to the heat of the burner.

THE extent of the coking coal region in Pennsylvania is estimated at 69,673 acres, and the number of coke ovens at 10,050. In addition, the section of 3,000 more has been decided on, and some are now in course of construction.

An Honest Job.

It ought not to be a cause of surprise or gratulation that an examination of the accounts of the great bridge discloses neither stealing nor dishonesty; but inasmuch as this great work scarcely has a parallel in this respect in the annals of modern "jobs," it would be unfair to withhold the highest encomiums from the officials who have done their whole duty to the public honestly and squarely.

For many months the experts have been at work checking off bills against accounts, examining contracts, and thoroughly overhauling the work from the foundations of the bridge to its opening. The experts had to consider the real estate used for bridge purposes, the cost and amount of material, and the cost and distribution of labor. Their work is now done, and their report will be presented to the Mayors this week. It appears that the experts have reached the conclusion that the bridge has been honestly and economically built; that considering the magnitude of the work the mistakes made have been singularly few in number and small in extent, and that the books have been remarkably well kept. The magnitude of the task may be understood from a single instance. Every one of 50,000 bills has been gone over, item by item; every figure on the books has been carefully checked off, and every contract has been scrupulously examined. That no errors should have been found was not to be expected. A few trifling mistakes in addition are reported, but they are insignificant. Several contracts were found to have been changed, but the variations from the original figures are reported to have been carefully noted down and explained. A little item, for example, of half a cent a pound for iron was observed; the engineer responsible for it was immediately called upon for an explanation. He made it at once; corrugated iron had been substituted for the material originally provided, but, as he showed, the cost of the higher priced material by the pound was more than offset by the smaller amount needed, and the bill was therefore reduced by the change. This is a typical instance, and the closest scrutiny failed to show a single suspicious or unaccountable variation.

Such a report, of course, is a final answer to thoughtless and malicious scandal. It will be accepted by the people of New York and Brooklyn as a compliment to themselves as communities that a great public work, begun at a time when society was greatly demoralized and unexampled frauds were in progress all over the country, was carried to completion without the improper expenditure of a dollar.

Former Discharge of Lake Winnipeg.

Recent exploration and leveling show that the surmise of General G. K. Warren, to the effect that Lake Winnipeg once discharged itself into the Mississippi on the south instead of Hudson's Bay on the east, is correct. Mr. J. D. Dana, the well known geologist, in a paper in the *American Journal of Science*, fully discusses the evidence, and shows that the change was due not to a barrier of ice or earth, but to a change of level over a wide area. The geological facts he adduces point to the following succession of events:

The lake deposits being underlaid by unstratified drift show that before the great lake existed, a glacier had moved southward over that region and deposited moranic material. The high level prairie on either side of the lake region and of the Minnesota valley is made up of this unstratified drift; but the generally level surface in the part next the lake valley and the stratification in the material show that the floods from the melting ice leveled it. This period of floods was followed by the era of the great lake, that is to say, of quiet waters and gentle deposits, with a slow discharge over the Lake Traverse region, which appears to have been brought about by a diminution in the slope of the general surface, which was part of a great change of slope which went on, as General Warren has explained, until the land was reduced to its present inclination and the stream to its present courses.

Patent Orphan Asylum.

One of the curious departments of the railway exhibition at Chicago has been dubbed "The Orphan Asylum." It consists of a large number of exhibits, mostly models of inventions, which were sent by unknown persons or were left to the tender mercies of the commissioners, with no one in charge of them. A great many of the orphans are car-couplers, and a great many more have been classified under that head for want of an explanation to show what they really are. One inventor who arrived late was indignant at finding his "patent protective helmet" put down as a parlor-car spittoon. Another draws attention to a life-saving device by means of a placard inscribed with the words: "Thou shalt not kill."

THE production of coal in Germany in 1881 is returned at 48,688,000 tons, as compared with 46,973,000 tons in 1880.

The Elevated Railways of New York.

Whatever may be said about monopoly, high fares, and watered stock, there is no local system of railways in the world that furnishes such admirable facilities for passenger transportation as the four lines of elevated roads in the city of New York. Since the trains commenced running on the two lines on the west side, nearly six years ago, the traffic has steadily increased, until in the earlier and later hours of the day it is equal to the capacity of the trains, which run at intervals as short as safety will permit. The number of passengers carried on all the lines, comprising 32 miles of road, during the half year ending March 31, was over 46,000,000, and the whole number for the current year will probably fall but little short of 100,0 0,000. There can be no stronger evidence than this of the nature of the service rendered by these roads, not only to the vast population of the city proper, but to immense throngs of people from the suburban towns on every side, who come and go every day, and at all hours of the day. The development of local passenger travel in the city within these few years has been tremendous. The time will never come when its rapid transit facilities will be less than they now are, at least not until some New Zealand artist shall perch himself on one of the crumbling piers of the Great Bridge to do a little sketching. It is even now a serious question how long these elevated structures, with all the trains that can be moved upon them, will be sufficient for the requirements of travel over and above the capacities of the present surface roads. It has taken forty years for the city to outgrow the capacity of the Croton Aqueduct, and it is possible that in less time than that the present surface and elevated lines will be supplemented by a half dozen underground roads, in order to meet the growing demand for urban transportation.

The fares on the elevated roads are five cents during three hours in the morning and evening, which is the same as on the surface roads; and were it not that the cars on both are at such times equally crowded, it might be said that passengers have their choice between the two. The superiority of the former, however, is an ample compensation for the ten cent fares during the rest of the day. The speed of the trains, the capacious, easy riding cars, well warmed and lighted, the freedom from obstruction, comfortable stations and waiting rooms, with gate and platform men charged with duties conducive to the safety and convenience of passengers, all contrast strongly with the absence of these most desirable things in the ordinary street car service. There is also a time schedule for all distances, which is adhered to with regularity and precision, and the average distance which a passenger is carried is five times what it is on the horse cars.—*Nat. Car Builder.*

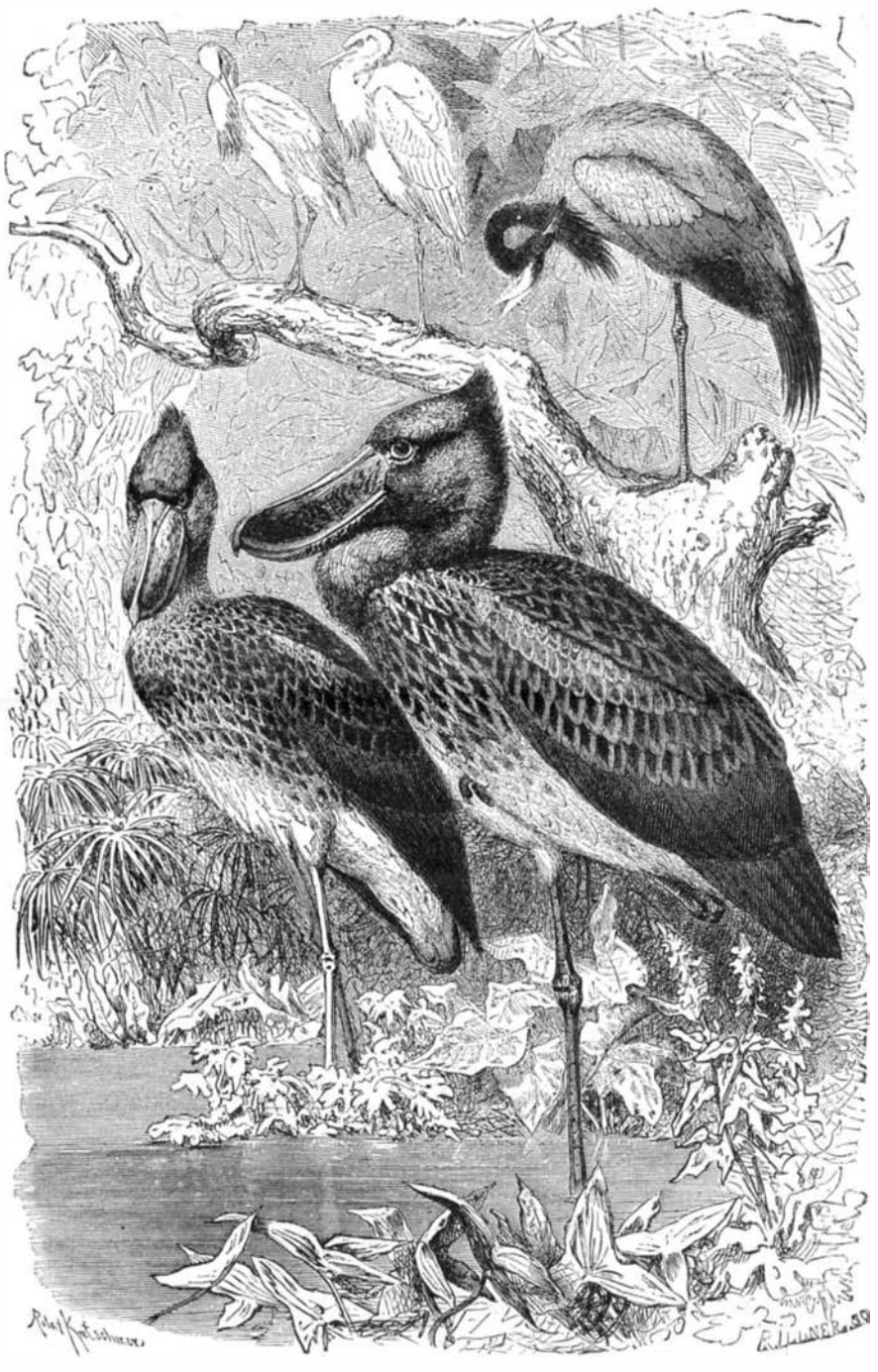
Chiccory as a Vegetable.

In Holland, Belgium, and the Grand Duchy of Luxemburg, the *Cichorium intybus*, or common chiccory, is improved by cultivation, and eaten as a vegetable, being called in Flemish "witteloof" (white leaf), like the allied plant endive. It is very agreeable to the palate and highly nutritious; it is said also to possess tonic properties. This plant is especially valuable, as it comes in during the first four months of the year, when other vegetables are scarce. The following directions for its cultivation are summarized from a contribution by M. Paris to the *Belgian Journal of Practical Agriculture.* In October, a bed is made in a light, sandy soil, dry rather than damp, four or five feet wide, and of a depth proportionate to the quantity of chiccory that it is desired to force. The surface of this bed, to the depth of four or five inches, is thrown to either side; and the subsoil turned over nine or ten inches deep. The chiccory roots are pulled up, and the tops cut off, leaving only an inch above the root. A cross trench is then made in one end of the bed, and the roots are planted therein upright, close together, so as to form a row two or three inches wide. The soil is then banked up against this compact row of plants, leaving only the leaves projecting. Another row is planted from two to four inches distant from the former, and so on, until the whole bed is planted. All the surface soil that was before taken off and thrown on either side, is then replaced; and, when it has somewhat settled and sunk, four or five inches more of light rich earth are thrown over, so as to cover the roots with about nine inches of soil. When it is desired to bring the chiccory on, that end of the bed which is to be taken first is covered with eighteen or twenty inches of fresh stable manure, well pressed down so as to heat. An equable temperature is maintained, either by adding more fresh manure, or by employing a straw covering. The young shoots, white and tender, soon force their way through the layer of earth, and may then be taken up for use from one end, but carefully, so as not to break them. Every twelve or fifteen days a fresh portion of the bed is heated, its size depending on the consumption, and this goes on until the month of April, when the plants sprout without forcing. They are cooked like sea kale, that is to say, boiled till tender, and served with gravy or white sauce. The chiccory is chiefly eaten with fowl and white meats, and is especially recommended to invalids and convalescents. In Brussels, the plant, deprived of refuse, is sold for about 2d. or 2½d. per pound in January.

THE SHOEBILL.

The Shoebill (*Balæniceps rex*), a singular African bird, is a representative of the family Balænicipidæ. It has a thick neck and large head, and a huge bill, which from its resemblance in size and shape to a shoe has gained for it the title of Shoebill.

Wood says: "The bill is enormously expanded at each side of the beak, the edges of the upper mandible overhang those of the lower, and its tip is furnished with a large hook, which is well suited for tearing to pieces the substances on which the bird feeds." It has very long legs and large feet, whose long toes are provided with powerful nails, broad and long wings, and a short tuft of feathers at the back of the head.



THE SHOEBILL.

The general color of the plumage is a beautiful ash-gray; the edges of the large feathers are bordered with light gray. The eye is bright yellow, the bill horn color, the foot black.

Young birds are a rusty, brownish gray. The length of the male bird is a hundred and forty centimeters. The female is considerably smaller. These giant birds of the morass, according to the observations of Heuchlin and Schweinfurth, live by pairs or in scattered companies—as far as possible distant from all human settlements, in the huge, almost impenetrable morasses of the White Nile and some of its tributaries, between the fifth and eighth degrees of north latitude. It has not been observed around the other waters of inner Africa. Usually this bird is seen standing fishing in the pools, in the midst of these swamps. It is very shy and cautious, and at the approach of man it rises with a loud rustling noise, and flies low over the reeds, which soon hide it from sight.

If it becomes frightened by the report of a gun, it rises high in the air, circles and hovers around for a long time, and will not return to the water as long as it suspects the presence of men. It is seldom seen on the banks of rivers. When walking it carries its body in a horizontal position, and rests its heavy head on its crop. When flying it draws in its neck. It makes a loud, rattling, cracking sound with its bill, which puts one in mind of the clatter of the storks. Its nourishment consists principally of fish, and it is often seen standing up to its breast in water, and thrusting its powerful bill suddenly under the water, in the same manner as herons do, in order to capture the fish. Petherick asserts that the shoebill catches and eats water snakes, and that it also feeds on the intestines of dead animals, the carcasses of which they easily rip open with the strong hook of their upper bill.

Their breeding time is in the rainy season, during the months of July and August, and the spot chosen for their nest is in the reeds immediately on the water's edge, or on some small, elevated, dry spot entirely surrounded by water. It builds from the dry stalks of the swamp, plants, sod, and mud, a very firm nest almost a meter in height. Heuchlin says the eggs are comparatively small, about eighty millimeters long and fifty-five thick; the shell is finely granulated.—*From Brehm's Animal Life.*

The Kremlin.

The ancient palaces of the Czar at Moscow, known as the Kremlin, are probably the most gorgeous examples of man's capacity to adorn and beautify that exist on the face of the globe. A New York *Herald* correspondent says: A walk through the halls of the Kremlin as prepared for the imperial pageant reveals splendors almost impossible to describe. To talk of them as reception rooms suggests nothing of the lavish beauty of decoration and the imperial splendor of the different halls and saloons. Every fresco has been restored, every carving regilded. All the embroideries, brocades, and tapestries have been especially made for the occasion. Baron Kohne had the direction of all the heraldic decoration. His taste in everything that concerns antiquity, ceremonials, and the science of imperial display is evident, from the great golden throne and draperies, over which the black eagle is seen in flight, down to the tabards of the heralds and the badges of the pursuivants.

In the Banquet Hall the embroidered cloth, which surrounds the lower tier and falls to the raised dais on which the buffet stands, is of crimson velvet, and is covered with the most elaborate embroidery of Byzantine design in colors and three tones in gold. This table cover and the carpet, which covers the floor of the halls, about seventy feet square, are the work of nuns, whose signatures are found in it, worked in Slav characters. In the right corner rises a throne of carved black oak, its roof supported, for it is almost a building in itself, by four pillars and raised on three steps. The whole is covered with crimson plush, backed with draperies of cloth of gold and ermine. A small table, which is also covered with crimson plush, stands before the imperial seats.

The floor of the Hall St. Alexandre is probably the finest piece of marqueterie known. Every kind of colored wood is used to produce the most intricate patterns of scroll and flower.

The Throne Room: so much magnificence is displayed in this floor, that one is scarcely prepared for the rich display which meets the spectator in the Throne Room or Salle Saint Andre. Architecture and decoration combine the severity of a Gothic abbey with the marvels of the Renaissance, a resplendent shrine. At the far end of the hall rises a shrine in gold, for indeed it is more like a shrine than a canopy. It has gold draperies on a silver and gold background, on which are the arms of the Emperor of All the Russias. The throne is supported by the gold griffins of the house of Romanoff, fringed with black, gold, and silver, the colors of the imperial standard. Enormous gilt chandeliers, each supporting thousands of wax lights, the wicks of which are all connected so as to light up simultaneously, hang from the roof and fall with weblike grace. Imagination can picture them ablaze and fill the glorious palace with the splendors of royalty, courtiers, and the fairest dames.

In melting coarse gold, blow the fire to a great heat and stir the metal with a stick of carbon, or the long stem of a tobacco pipe, to prevent honey-combing. If steel or iron filings get into gold while melting, throw in a piece of saltpeter the size of a walnut; it will attract the iron or steel from the gold into the flux; or, sublimate of mercury will destroy the iron or steel. To cause gold to roll well, melt with a good heat, add a tablespoonful of sal ammoniac and charcoal, equal quantities, both pulverized, stir up well, put on the cover for two minutes, and pour.—*The Jewelers' Journal.*

RECENT INVENTIONS.

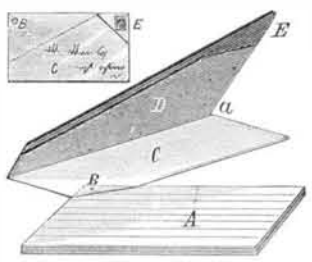
Improved Cash Desk.

This is an elevated desk used with the mechanical cash carrier system now in vogue; and it consists of a contrivance of the stairs for entering and leaving it, to slide under it when not required for use, as shown in the engraving, and to be shifted from under it for use, as shown in dotted lines.

Means are provided by which the occupant of the desk may conveniently shift the stairs as required, the object being to economize floor space in the store. In case a circular stair is used it may be arranged to swing on a pivot, or, if preferred, it may be made to slide the same as the other. In this case, when the stairs swing, the rails attached to the floor of the desk, and on which the stairs are suspended, will be circular to correspond with the direction of the movements of the stairs. Any suitable jointed or flexible hand rail adapted to be folded down and set up readily may be applied to the stairs. This invention has been patented by Mr. James Fanning, of 15 Becket Street, Salem, Mass.

Paper and Envelope Package.

The engraving shows a novel paper and envelope package recently patented by Mr. Samuel J. Spurgeon, of Liberty, Mo. This package is designed as a convenience for travelers and others who require stationery in compact and convenient form. A series of sheets, A, of writing or note paper are united at one corner by an eyelet, B, and by means of the eyelet the covering sheet, C, is held on the package.



This covering sheet is of the size of the sheets of writing paper, with an additional flap, D, having one edge cut diagonally. The width of the flap, D, at the widest end is equal to the width of the sheets, A. The flap, D, is gummed along the diagonal edge on the inner surface. The writer writes on the sheets, and then folds them over the eyelet in such a manner that the covering sheet is folded over the eyelet. The covering sheet, C, is creased at the base of the flap, D, and is folded over the uppermost sheet, the gummed edge and corner of the flap are moistened, and the flap, D, is folded over the lowest sheet, A, to which it adheres, and the corner, E, is folded over the uppermost sheet, A, to which it also adheres, thereby holding the package closed. The stamp can be gummed on the corner, E, or on the edge as a further security.

Bridle Attachment.

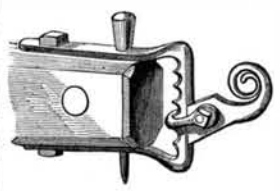
This invention relates to an attachment to bridles, to be used therewith with bits or not, as desired; and it consists of a contrivance of nose clamping strap having end rings through which pass the ends of a chin strap connected by rein straps passing through rings of a head strap of the attachment, which is connected with the crown strap of the bridle, the invention comprising also a connection of the martingale straps with the rings of the nose clamping straps, whereby the attachment may be used for both driving and riding, to powerfully check up the horse when required, and also to prevent rearing and plunging of the animal by producing a pressure on his nostrils to cut off his breath. Mr. John C. Massey, of Round Mountain, Texas, is the patentee of this invention.

New Secretary.

The secretary shown in the engraving is provided with a novel device for holding a book in front of a writer, and for supporting it inside the secretary when not in use. This holder consists of two rods bent into a peculiar shape, so that when the crank attached to one of them is turned, the book is placed in an inclined position convenient for reading, reference, or copying. Another movement of the crank will place the book in a horizontal position in the secretary, where it will remain until again wanted. The space beneath the book holder is triangular and is fitted with suitable receptacles for writing utensils, etc. The sides of the space around the book holder may be fitted with pigeon holes for the reception of papers, etc. The lower part of the secretary is divided into compartments, and there is a drawer which supports the desk when the latter is let down into position for writing. The desk when folded up closes the front of the upper part of the secretary. This invention has been patented by Mr. J. C. Pardue, of Parson Street, West St. Louis, Mo.

Plow Clevis.

This is an improved device for hitching the team to the clevis, the object being to prevent the hitching device from dropping out of the notch in the clevis head, by which the pitch of the draught of the plow is regulated. The inventor uses either a hook or an eye and a small clevis for hitching the team to the notched head of the main clevis, connecting the hook or eye to clevis by a bolt. The hook or eye is made with a grooved and inclined butt extension sufficiently long to bear on head of the main clevis, and prevent the hook or eye and small clevis from swinging downward and falling out of the notch in which it may be set, so that when once set in position the device will not fall down and require resetting. This useful invention has been patented by Mr. Andrew Patton, of New Orleans, La, P. O. Box 2689.

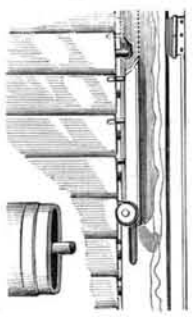


Novel Napkin Holder.

The annexed engraving shows a very compact and portable napkin holder that may be conveniently applied, and will hold the napkin in the most desirable position. The device, as will be seen by the engraving, is capable of being folded one part over the other, so as to be readily carried in the pocket, and when unfolded it hooks over the collar, and its extended arms receive the napkin in the spring clips at the end, as shown in Fig. 1. Fig. 2 shows the holder made of wire without joints. Fig. 3 shows the folding holder detached from the napkin, and Fig. 4 shows the holder folded up. These holders are neatly plated and finished. For further particulars address Mr. A. Fruth, No. 1212 Washington Avenue, St. Louis, Mo.

New Blind Stop.

This is a novel device by which blind slats may be swung on their pivots, so as to open or close to the extent desired. One end of each slat is slotted either by grooving the wood or applying a metal band or ferrule, and in a slot of the stile alongside of the pivots is arranged a bar with a series of stud pins one for each slat, the pins projecting into the slots of the slats, so that they will be opened and closed by sliding the bar up and down. The bar is provided with a knob connected to it by a thumb screw projecting out through a slot in the front of the stile. The knob is arranged to screw up tightly against the side of the blind stile, to clamp the bar fast and lock the slats in the desired position. To permit the slats to be adjusted or removed from the frame of the blind without taking the frame, one of the stiles of the blind is rabbeted and provided with a strip secured removably by screw. This invention has been patented by Mr. Charles F. Vandervoort, of Corpus Christi, Texas.



Radiation of Silver.

At the Congress of Electricians in 1881, the author proposed as an absolute standard of light the radiation emitted by a square centimeter of melting platinum. He has since made certain experiments with silver. Liquid silver, at a temperature higher than its melting-point, being allowed to cool, it is observed at first that the radiation decreases more or less rapidly, according to the construction of the vessel containing the melted metal. The decrease slackens, and at the moment when solidification begins along the margin of the vessel, a small increase is produced. The liquid forms then in the midst of the soldified portion a kind of pool, the shores of which gradually advance, and during all this phase of the phenomenon the radiation of the liquid part remains constant. When the solidification reaches the center there is a slight increase, followed by a rapid decrease. Silver yields thus a fixed secondary standard, which will be very useful in all spectro-photometric measurements, where the absolute intensity of the radiations is in general of little moment.—*J. Violle.*

AN Indiana lumberman asks the *Northwestern Lumberman*: What will prevent heavy ash and oak from checking? To which the editor replies: The ends of hardwood logs for export are covered with a coat of paint to prevent them from checking, and the same treatment would be applicable to logs or timber not for export. To prevent the sides of plank from checking they should be properly piled and protected from the rays of the sun.

THE COLLEGE OF NEW JERSEY.

The 137th annual commencement of the College of New Jersey at Princeton has been celebrated during the past week, and the last twelve months of the career of this institution have been marked by such conspicuous changes and such encouraging promises for the future, that the exercises of this year have been rendered more than usually interesting. Last year at this time the college was rejoicing over the completion and formal dedication of the new Marquand Chapel, with its graceful minaret and richly stained windows. This year, although a visitor to the campus would notice no material external change, within the college walls he would find vast improvements.

The Halsted Observatory no longer rears its graceful dome an empty shell, but now can boast of the largest refracting telescope of any college in the country—an illustration of which we gave our readers last autumn, and a full description from the pen of Professor Young accompanied the engraving. The establishment of an art school, which for a long time has had a potential existence in the minds of some of the friends of the college, is at length likely to become a reality, and $60,000 have already been subscribed from the estate of the late Frederick Marquand for this purpose; and further, on condition that a suitable fireproof building be erected for the school, Mr. William Prime, of New York, has promised his collection of pottery, than which there is no finer and more complete in this country. A more recent innovation, however, and one which has been most energetically carried out by the president, is the founding of a school of philosophy. Princeton has always maintained such a prominent position in this department of science, that it seems peculiarly appropriate in her to strive still further to broaden her fields of study in this direction. For the suitable endowment of this branch $200,000 are needed, and of this amount $150,000 has already been subscribed, by Mrs. Robert L. Stuart, of this city, the living representative of that family which has already done so much for the theological seminary and college at Princeton. Four new chairs will be needed for this department, one of which will be held by the venerable Doctor McCosh, the present incumbent of the presidential chair.

In spite of all this advancement there is one matter for regret, and that is the loss of Mr. McMaster, who is about to resign his present position at Princeton for a more important chair at the University of Pennsylvania. It seems a pity that, after so many years of persevering, silent, almost secret labor upon his history of the people of the United States, which has so suddenly and without any warning brought him into such prominence and distinction, now he should be permitted to leave the scene of his trial and triumph without any adequate effort being made on the part of the authorities to prevent his breaking his connection with the college.

The only other specially notable event of the year is the resignation of Dr. McCosh from the presidency. Fortunately the acceptance of this resignation and the choosing of a successor have been indefinitely postponed by the appointment of Dr. Murray as dean of the faculty. By this arrangement Dr. McCosh will be relieved of a good many of the business details of the college, which will enable him to devote more time to his professional duties. On the whole, the college seems to be in a more prosperous condition than at any time since its founding in 1746.

Liquefaction of Nitrogen.

Having liquefied oxygen in a complete manner, we proceeded to nitrogen. This gas, cooled in a glass tube down to —136° and submitted to a pressure of 150 atmospheres, still remained gaseous, and nothing could be seen in the tube. If suddenly released, there is in the whole tube a tumultuous ebullition comparable only with the ebullition of liquefied carbonic acid in a Natterer's glass tube, when plunged into water at a temperature a little higher than the critical point of carbonic acid. But if the release is effected slowly, and if the pressure while being reduced is not allowed to go beyond fifty atmospheres, the nitrogen is completely liquefied, presenting a very distinct meniscus, and evaporating rapidly. Thus nitrogen only remains for a few seconds in the static condition of stable liquids. In order to keep it longer in this state, a temperature would be required lower than the minimum hitherto produced. Such a temperature the authors are seeking to obtain. Liquid nitrogen is colorless and transparent, like oxygen and carbon dioxide. The authors add that they have since liquefied carbon monoxide in the same manner, obtaining a colorless liquid, which shows a distinct meniscus.—*S. Wroblewski and K. Olszewski.*

International Exhibition at Nice.

An international exhibition of manufactures, fine arts, and agriculture, under the patronage and auspices of the French government, the municipality, the general council of the Department, and the Chamber of Commerce will be held at Nice, France, from the 1st of December, 1883, until May 1st, 1884.

A jury composed of about fifty of the leading representatives of science, industry, agriculture, and commerce, both in France and abroad, will award the various prizes, which will consist of diplomas of honor, gold, silver, and bronze medals, and honorable mentions.

No more attractive location could have been selected for this exhibition than the city of Nice, with its cool yet semi-tropical climate, and with the advantages of its hotel accommodation unsurpassed by any town in France.

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.

LABOR AND CAPITAL. By Edward Kellogg; edited by his daughter, Mary Kellogg Putnam. Lovell's Library Series. John W. Lovell & Co., 14 and 16 Vesey Street, New York.

This is a revision and republication of a book published as long ago as 1848, which was at once acknowledged as a text book or reference volume by thinkers on financial matters. The author, a rich and prosperous merchant, was a man of deep perception, and evidently foresaw, to a certain extent, the financial embarrassments that occurred in the succeeding thirty years. His predictions have become fact, and his theories have been largely embodied into principles.

INQUIRIES INTO HUMAN FACULTY AND ITS DEVELOPMENT. By Francis Galton, F.R.S. Macmillan & Co., New York.

The object of this volume is to show the possibility of improving the human race by means that act through heredity—the application of the principles of evolution to the generation of human life and the development of human character. The author has used photography successfully in a unique manner, to show the generic likeness of individuals in a family and in community, the results being wonderfully surprising, as in a composite likeness made from twenty or thirty pictures from as many subjects. Not the least interesting portion of the book is the record of evidences of change in the race by slow moving influences, that work so gradually as not to be noticed until presented through the perspective of centuries.

THE PHONOGRAPHIC DICTIONARY, CONTAINING THE OUTLINES OF MORE THAN 30,000 WORDS IN REPORTING FORM. By Ben Pitman and Jerome B. Howard. Phonographic Institute, Cincinnati, Ohio.

A book of 230 pages, for desk or pocket use, containing the phonographic word forms and their significations, arranged in double columns alphabetically, related words being in juxtaposition. The clear type on smooth, thick paper gives additional value to the volume.

REPORT OF THE BUREAU OF STATISTICS OF LABOR AND INDUSTRIES OF NEW JERSEY. W. S. Sharp Printing Company, Trenton, N. J.

This volume treats on the wages of workmen and workwomen, on combinations and societies of working people, building and loan associations, agriculture, manufactures, and the fisheries. The chapters on the carp and the oyster are particularly interesting. From the latter we learn that the ancient Romans had an objection to oyster eating at certain seasons, like our custom of rejecting them in the R-less months.

THE NATURAL CURE OF DISEASE; ORIGINATION AND PREVENTION OF SICKNESS; A HEALTH MANUAL FOR THE PEOPLE. By C. E. Page, M.D. New York: Fowler and Wells, 753 Broadway.

The author explains how health may be enjoyed by the use of natural means, as opposed to artificial systems. His theory is sustained by examples, which gives a special value to the book.

HOW TO GET ON IN THE WORLD, AS DEMONSTRATED BY THE LIFE OF WILLIAM COBBETT; WITH COBBETT'S ENGLISH GRAMMAR. By Robert Waters. New York: James W. Pratt, 75 Fulton Street.

The life of William Cobbett will always be attractive. From plowboy to member of parliament, from private soldier to famous author, are extremes of possibilities that will always interest the young. Cobbett's grammar, which comprises one-half of the volume under consideration, and consists of a series of lessons under the guise of letters, is not excelled as a text book for teaching the principles of English grammar and the proper use of the language. This portion of the volume makes the book especially valuable.

EXTRACTS FROM CHORDAL'S LETTERS, ORIGINALLY PUBLISHED IN THE *American Machinist*. New York: John Wiley & Sons.

This volume contains shop criticism, shop philosophy, shop talk, and outside moralizing in queer juxtaposition. As an attempt to interest the worker and stimulate his energies it has its uses. The writer has evidently "been there." In his preface the author says that the letters, which are the basis of the volume, were written "without continued thought on any one subject, presenting topic rather than thought," and he disclaims the merit of consistency in regard to the side of the question he may take. The volume contains a steel engraved portrait of the author.

TOBACCO: ITS EFFECTS ON THE HUMAN SYSTEM, PHYSICAL, INTELLECTUAL, AND MORAL. By Dr. Wm. A. Alcott; notes and additions by Nelson Sizer. New York: Fowler and Wells, 753 Broadway.

This is a republication of a well known treatise, with additions and examples which make it applicable to the cigarette-smoking lads of the present day. Some of the cases of cure of the habit of tobacco using are quite interesting.

PRACTICAL GUIDE TO SCENE PAINTING AND PAINTING IN DISTEMPER. By F. Lloyds. Illustrated by the author. New York: Jesse Haney and Co., 10 Spruce Street.

THE MATERIALS OF ENGINEERING. PART II. IRON AND STEEL. By Professor Robert Thurston, Professor of Engineering at the Stevens Institute of Technology. New York: John Wiley & Sons, 15 Astor Place, New York.

This comprehensive book gives a general description of the metals, the production of iron and of steel, their manufacture to forms, tests of their relative strength, and the absolute qualities of iron and steel as shown by various tests. The book is well illustrated and is valuable for reference and authority.

THE LIFE OF SIR WILLIAM E. LOGAN, FIRST DIRECTOR OF THE GEOLOGICAL SURVEY OF CANADA. By Bernard J. Harrington, B.A., Ph.D. New York: John Wiley and Sons.

The subject of this memoir is well known to geologists in this and other countries. Probably the basin of the St. Lawrence and the country of upper Maine are better known from his reports than from anything and everything that had preceded them, although previous to beginning his survey in 1842, Murchison had completed his "Silurian system" and Sedgwick had published his classification of the Cambrian rocks. The volume of nearly 450 octavo pages is enriched by a steel plate portrait of Sir William and a number of engravings. The body of the narrative of his explorations is in his own words, and the attractiveness is largely due to his piquant style.

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) G. W. B. asks: 1. Can the dynamo electric machine, SUPPLEMENT No. 161, be used as an electric motor? A. Yes. 2. If so, what alterations would be necessary in its construction? A. It is necessary to readjust the commutator.

(2) S. E. N.—The expression soft as used by you is somewhat vague, as it may be meant to include the properties of malleability and ductility. Lead ranks sixth among the list of the former and ninth as regards the ductility. On the mineralogical scale of hardness lead is 1·5, with 1 being represented by talc and 10 by the diamond. Certain of the elements, such as mercury and gallium, are softer. Again, lead itself varies according to its purity, and it is softest when most pure. In metallurgical works it is generally treated to a so-called "softening" process of alternate oxidation and removal of dross until a proper degree of "softness and malleability" is obtained. Its softest condition is brought about by melting and pouring in a mould until a desired state of purity is reached.

(3) C. W. & Co. ask: Can you give a receipt for cleaning and removing leather belting which has become soft and useless from oil? A. If the belting is not brittle or rotten, a thorough wiping off of the excess of oil and scraping the face with a sharp tool to take off the gummy matter, and finally wiping the inside with a little naphtha or gasoline upon a cloth, will generally restore the belt. The pulley should be cleaned also; then you can increase the efficiency of the belting by rubbing the inside with a piece of beeswax. Only a little should be applied. If the belting has become weak and rotten, it should be thrown away.

(4) L. C. S. asks: 1. What would be the proper rated horse power of a balanced valve engine, cylinder 3 inches bore and 3½ inches stroke, pressure in boiler 60 pounds, strokes per minute 400? A. About three-fourths horse power. 2. Also a cylinder with $1\frac{5}{16}$ inch bore, 1¾ stroke, 40 pounds pressure in boiler, and 800 strokes per minute? A. About one-fourth horse power. 3. Also the same at 600 strokes per minute? A. About five-sixteenths horse power.

(5) J. A. S. writes: I have a saw mill, and have not power enough to run all of my machinery. Could I increase the power by adding one more boiler and carrying the same amount of steam on the two as I would on one. My engine is 40 horse power and my boiler 30 horse power. A. If you add another boiler, and can alter the connecting gearing between the engine and mill so as to increase the speed of the engine say 25 per cent, your power will be increased in the same proportion.

(6) J. C. M. writes: I have a good sized row boat which I should like to rig up for sailing. It sails well enough before the wind, but not having a center board, I can't tack; to cut through the keel would weaken the boat too much; what can I do? A. Put a "lee board" on each side.

(7) H. W. N. asks: Will you state what is the proper distance for fire space between grate bars and bottom of boiler for a wood burning furnace for a 20 horse power boiler, 42 inches diameter and 8 feet long, with 54 tubes? It was made for coal, and the grate bars are only about 18 inches from boiler now. Some contend that it is right now, others claim it is wrong. Please put us and others right in the matter. With good hickory wood at $3.00 per cord and anthracite coal at $6.00 per ton, which is the cheapest steam generator? Can you give an exact rule for determining the length of inch pipe necessary for heating work shops in different departments so as to have uniform heat at 76° to 80° Fah. where rooms vary from 12 feet by 14 feet to 30 feet by 32 feet and 30 feet by 70 feet, 8 foot, 9 foot, and 12 foot ceilings? Can power be transferred from a dynamo three miles over any kind of cable, with loss of only 33 per cent? A. The height of fire chamber—18 inches—is too low for a wood fired boiler of 42 inches diameter. For hard wood, 24 inches will do; 28 inches is better. Good dry hickory at $3 per cord is cheaper than anthracite at $6 per ton. A cord weighs 4,000 to 5,000 pounds, and its evaporative power is about 50 per cent of coal per pound weight, making their values equal at equal prices. For heating shops with 1 inch pipe, one foot 1 inch pipe to 40 cubic feet of space in small rooms. Large rooms, 1 to 50 is good practice. If the rooms are close, a little less. If many windows or skylights, add 5 or 10 per cent, as you may judge. The loss in transmission of power by dynamos in actual practice is more than 33 per cent.

(8) C. H. D. writes: I noticed in SCIENTIFIC AMERICAN, No. 19, dated May 12, 1883, an item relating to quarter and bastard sawed yellow pine. Please explain what is meant by both of these terms, as I never heard them applied. A. "Bastard sawed" lumber is the ordinary sawing, and used only to distinguish it from special names. "Quarter sawing" is cutting the log in 4 quarters and then, sawing corner wise, or at 45° to the quarter cuts. When the cuts are across the annual rings the boards keep their shape best, that is, do not warp. When the cut is at right angles to the above, or with or partially parallel to the rings, it will have a tendency to warp, but is preferred for its figure and beauty of grain when used for furniture or finished interiors.

(9) E. W. S.—The only difference in the pressure of different parts of a boiler is due to the hydrostatic weight or pressure of the water. Above the water line the pressure is equal to the steam pressure. At 27 inches below the water line there is about 1 pound more pressure than is indicated by a correct steam gauge.

(10) F. P. L.—For chemical barometer:

Camphor	2½ drachms.
Alcohol	11 "
Water	9 "
Saltpeter	38 "
Sal ammoniac	38 "

Dissolve the camphor in the alcohol, the salts in the water, and mix the solutions together.

(11) J. C. S.—Glass may be etched with hydrofluoric acid; see SCIENTIFIC AMERICAN SUPPLEMENT, No. 313, for details of manipulation. Steel is generally etched with a solution consisting of nitric acid 1 part, acetic acid 1 part, water 3 parts.

(12) M. E. M. writes: I read an article in SCIENTIFIC AMERICAN of May 5, concerning "Utilization of Diseased Potatoes." It was stated that the water in which the potato was cooked was a violent poison. This lead me to inquire whether or not the water in which any potato is cooked is wholesome? Now that Paris green is so generally used, may not *all* potatoes be slightly diseased? It is the custom of many housekeepers to use the water in which potatoes are boiled for making bread, generally mashing some of the potato also and putting into the flour. Is this a deleterious practice? A. The very poisonous alkaloid solanine is contained in the potato, and is extracted by treating the potato with acidulated water. Hence the use of water in which potatoes have been cooked is not advisable.

(13) T. J. H. asks why it is that a boat that runs five miles an hour in dead water, can run more than ten miles an hour in a stream that flows at the rate of five miles an hour? I know you say it can be done, but I can't understand how it is. A. Because, when running with the current, the boat is running "down hill," and gravity aids in propulsion. So if the boat made five miles per hour, she could not hold her position against a five mile current, or if the boat made seven miles per hour in still water, she could not make two miles per hour against a five mile current.

(14) V. B. writes: Please give the horse power of a Worthington duplex steam pump of the following dimensions: diameter steam cylinder, 20 inches; length of stroke, 15 inches; number of strokes per single piston, 72 strokes per minute; steam pressure, 75 pounds per square inch. A. If your average pressure on the piston is 75 pounds per square inch, 108 horse power each cylinder; but if the boiler pressure is 75 pounds, the average pressure on the piston is probably much less.

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