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THE SCIENTIFIC AMERICAN SUPPLEMENT

No. 344,

For the Week ending August 5, 1882.

Price 10 cents. For sale by all newsdealers.

THE DECLINE OF SCHOOLING.

At the recent meeting of the New York State Teachers' Association, the report of the Standing Committee on the Condition of Education showed that, notwithstanding the steady increase in the population of our State, the number of children in daily attendance upon the public schools is declining. The decrease was attributed by the chairman of the committee to "the increased demands made by manufacturing interests," by which was meant, we presume, an increased employment of children in factories.

The lessening number of children in school is not peculiar to New York State or to factory towns. At other teachers' gatherings this summer the same condition of things has been noted and variously commented upon as being more or less visible throughout the country, and more or less to be deplored.

The general feeling seems to be that the schoolmaster is losing his grip, and that the country is likely to suffer in consequence. That the schools are or can be in any way to blame for the declining popular interest in schooling, the school authorities are naturally not disposed to believe; nor does it seem to occur to them to think that their apparent loss of influence may really be an indication of the spread of juster views than formerly prevailed of what is proper for youthful culture.

To say that fewer children "of school age," in proportion to the school population, are now to be found any day in school than was the rule twenty years ago, is very far from saying that proportionally fewer children are being properly educated now. The legal "school age" begins in this State at three years. Formerly the custom was to send little boys and girls three and four years old to the public school; and such is largely the custom still among the poorer classes. With well-to-do people, we are happy to believe, the sending of such small children to school is becoming more and more the exception. The growing feeling is, that even when the school house is kept in a condition sanitarily fit for the reception of infants—which, we fear, is rarely the case—the beginning of school life had better, for the children's sake, be put off until they are six, eight, or, when home conditions are right, ten years old. For this reason a vast multitude of children, whose educational prospects are the brightest, are now kept from school. If the school work were differently planned and regulated, it might be better for some of these children to be in school a little every day; but not under present conditions. The fact that they are not in school, however, must not be taken as evidence that popular interest in education is declining, or that popular education is likely to suffer for it. As a rule children who begin serious school work at eight or ten years of age are as far advanced in their studies at twelve as those who begin at three or four, and usually they are both physically and mentally in better condition for instruction.

Not so satisfactory is the frequent cutting off of the other end of the period spent in school; and yet even that is not an unmixed evil, as the schools are usually conducted. When the free school system was first developed, the belief was general that schooling was the one thing needful to enable young people to get on in the world; and it was a common thing for parents to make great sacrifices to keep their children year after year in school, only to find in the end that their sons were too old to do boys' work, and too proud to begin at the bottom of any trade or other industrial calling and work up. They must do something more genteel, and crowded into the towns and cities in pursuit of clerkships and quasi-professional engagements, in which a little present salary was accompanied with extravagant expectations seldom or never to be fulfilled. Others as unwisely pressed on in their school course, mortgaging their future to prepare themselves for learned professions, vainly seeking to win fame and fortune in places for which they had no real fitness. The condition of much schooled but ill educated girls was, if anything, still worse.

A natural reaction against this misdirection of youth and natural result of the failure of the public schools to shape their work to meet the practical wants of the multitude, is the disposition to cut short the school period early to begin in earnest what seems to be the real business of life. Though ninety-nine in every hundred youth cannot hope to go to college, their educational needs are largely sacrificed to make the school a possible tributary to the college. Time which the majority of youth need for practical preparation for their life's work is thus very largely given to studies of value only in their relation to a subsequent college course which is never to be enjoyed. It is no evidence of popular unwisdom, as most teachers seem to think, that there is an increasing popular indisposition to surrender so much of youth's precious time to such unpractical work. There is nothing so valuable to youth as education, but unhappily schooling and education are yet far from being synonymous; and if the schools are declining in favor, it is because the intelligent public see this fact more clearly than the mass of school officials do.

MORE INNOCENT BUYERS NEEDING PROTECTION.

The readiness of certain "innocent" farmers of the West to take the risk of an extra good bargain under questionable circumstances has led a good many in Iowa into trouble the past summer, and not with patent rights either. As described by the *Iowa Homestead*, the swindle which they have suffered is worked in this way: "Two rogues watch the papers for estray notices. When one is published, one of them goes to look at the animal. Of course, on application, the unsuspecting farmer shows the beast, and the fellow decides that it is not his, and then he returns to his partner and describes the animal to him minutely. No. Two goes to the farmer, and after proving by his thorough description that he is the owner of the animal, says he cannot take it away, and offers to sell it at a bargain. The farmer buys, and in a few days the rightful owner comes along and claims the animal, and of course the farmer is out just so much."

If the victims of these swindles were mere mechanics or other artisans not generally interested in the ownership of cattle, it would be easy to provide a remedy for the wrong here complained of. Some Eastern Congressman might be got to push through the National Legislature a bill to prevent the recovery of cattle that had been "innocently" bought and paid for under the circumstances described. But that remedy is barred by the fact that the innocent buyers are also cattle owners, and occasionally cattle losers; and they would not like to have the general security of their property in cattle unsettled for the sake of guarding them from possible losses in an occasional over-promising purchase. Estrays would be altogether too numerous, and the trade in them too lively under the action of such a law, and Congress would be promptly overwhelmed with rural protests against it.

Seeing that the evil cannot be cured by legislation, we can only hope that education through experience will suffice for the purpose. Two or three "innocent" purchasers in any neighborhood, with subsequent loss, should be enough to "protect" the community from any further imposition of that sort. If more farmers were patentees—as they ought to be—the same rule would suffice equally with respect to the "innocent" purchaser of patented articles from unauthorized sellers.

A LABOR STORM-CENTER.

The city of Pittsburg may just now be regarded as occupying the position of a labor storm-center. Southwest, at Cumberland, Md., the coal miners have for five months been engaged in a strike against a reduction of 15 cents per ton in mining coal; southeast, and at the gates of the city, the miners in the famous Pan Handle gas coal region, have been idle since April first, striking against a reduction of one-half cent per bushel; northeast, the miners are disturbed and inclined to strike for an advance of 15 cents per ton; west, the miners of the Hocking Valley, O., region are striking against a reduction of 10 cents per ton. Worse than all, the great iron mills of the west and northwest, after a brief stoppage, through strikes among the iron workers, have started up, agreeing to pay their men the scale of prices "which shall be fixed at Pittsburg." This makes of the latter city the battle ground of the existing iron strike. Since June 1st, an army of 10,000 idle iron workers have been upon the streets of Pittsburg, and her proverbially smoky atmosphere has given place to one as clear as New York or Brooklyn possesses. In Pittsburg are the main offices and headquarters of the most powerful labor organizations in the world. The Amalgamated Association of Iron and Steel Workers includes operatives in nearly every iron and steel mill from Maine to the Rocky Mountains, and possesses a membership of at least 50,000. The Knights of Labor, with a membership of from 15,000 to 20,000, comprises all manner of industries other than iron and steel; the Miners' Association possesses 12,000 members, all coal miners. In addition, there are the telegraphers, the glass workers, and other trades unions, whose largest membership is found in the same city. It is the demand of the iron puddlers—members of the first named organization—for 50 cents advance per ton in their wages, which brought about the existing iron-workers' strike, a disturbance in which both sides seem as firm to-day as they did nearly two months ago. The varied episodes of these strikes, as noted in and about Pittsburg, would, in the hands of a second Charles Reade, furnish abundant material for a volume surpassing in interest that writer's "Put Yourself in his Place."

FIRE RISKS WITH ELECTRIC LAMPS.

In obviating the fire risks incident to the use of oil and gas lights, electric illumination has quite fulfilled the promises first made for it, but users of electric lights are learning that they are not without their own peculiar hazards, which experience is the only means of discovering, hence the need of especial watchfulness for new developments in every part of the electric circuit.

It will be remembered that the burning of a factory in Philadelphia some months ago was attributed to sparks of molten copper from the coating of the carbons of an imperfectly shielded arc-lamp. More recently, in the same city, a large show window in a popular dry goods store was fired by a Jablochkoff candle. A careless attendant had neglected to screw on the brass cup below the light, and as soon as the current was turned on the fabrics in the window were ablaze from a shower of white-hot particles thrown off by the lamp. This was obviously no fault of the lamp, but the incident goes to emphasize the need of great care in its manipulation.

Even the purely incandescent electric lamp is not without its dangers, as was discovered in a Philadelphia drug house a few days ago. One of the strong claims of this method of lighting has been its alleged inability to set anything afire. The nature of the "low tension" current supplying incandescent lamps was thought to forbid the system's ever playing the part of an incendiary, while the security of the lamps

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was publicly demonstrated by breaking the glowing lamp in the midst of highly inflammable stuffs. Yet, in the case just referred to, a defective lamp came very near starting a serious fire. The lamp was in use in a cellar, and except for the fortunate entrance of an employe, the fire might never have been explained. He found the wires of the lamp—a Maxim lamp—white hot, with their paraffin coating blazing up against the beam and floor above. A well-directed hatchet stroke severed the wires, and the fire was stopped. An examination showed, according to the statement of Mr. McDevitt, Superintendent of the Insurance Patrol, that of the two wires, the one that enters the side of the brass shell below the glass globe in one of the lamps, and which is supposed to be firmly held in place there by a drop of solder, was not in fact so held, but seemed to have been loosely tied to the shell with a bit of copper wire, and to have dropped down from that imperfect fastening, crossing the other wires and establishing electrical connection with it. Both wires were, of course, white hot instantly. They were covered with a heavy insulating coating, mainly composed of paraffine, and that substance burned at once. But for the timely discovery of the accident the entire establishment might have been destroyed. Upon a careful inspection being made of the other lamps on the premises, one or more was found in which the wire was simply tied on, and two others from which the drop of solder had been melted away, or else had never been there, so that the wire was loose and liable to fall at any moment.

Thus we see in one city, and within a few months, each of the types of electric lamps has been the cause of a fire. However safe, as compared with kerosene, the electric lamp will bear watching.

THE ABSORPTION OF METALLIC OXIDES BY PLANTS.

The *Journal of the Franklin Institute* for July contains a detailed report by Mr. Francis C. Phillips of a series of experiments undertaken by him to determine whether any injurious effects are produced upon plants by the presence of certain metallic oxides in the soil, and whether healthy plants will absorb such oxides through their roots.

The experiments of Dr. Freytag, at Bonn, quite positively indicated that growing plants would take up mineral poisons, and that without injury until a limit of poisonous concentration was reached, when they rapidly withered and died. The plants showed no discriminating or selective faculty, but took up any matter in a suitable condition. Other experiments in Germany have since contradicted the results arrived at by Freytag, and so have certain tests with Paris green reported by our own Commissioner of Agriculture.

Mr. Phillips experimented with carbonates of zinc, copper, and lead, and the arsenate of lime, compounds which are almost absolutely insoluble in water. The plants were geraniums, coleas, ageratums, achyranthes, and pansies, which were selected not with reference to any special peculiarities of the plants, but for the reason that there were thousands of other plants of the same kind, and all equally advanced in growth, on the tables of the greenhouse, which afforded an opportunity for a close comparison of those grown upon poisoned soil with others grown under normal conditions.

The conclusions arrived at by Mr. Phillips are:

1. That healthy plants grown under favorable conditions may absorb through their roots small quantities of lead, zinc, copper, and arsenic.

2. That lead and zinc may enter the tissues in this way without causing any disturbance in the growth, nutrition, and functions of the plant.

3. That the compounds of copper and arsenic exert a distinctly poisonous influence, tending, when present in larger quantity, to check the formation of roots, and either killing the plant or so far reducing its vitality as to interfere with nutrition and growth.

In the case of the heavy metals, copper, zinc, arsenic, and lead, it seems to be probable that their oxides may under certain circumstances become deposited in the tissues of the plant.

These results have a direct bearing upon the conduct of many industrial operations involving these metals. If crops may become hurtful through the absorption of poisonous elements in the soil, the greatest care should be exercised to prevent the dissemination of these metals by the vapors of smelting establishments and the like.

ACCURACY IN TELEGRAPHING.

When the telegraph was first established, with a new system of representing words, and of necessity employing operators new to the business, there was reason enough in supposing that a large allowance should be made for operative errors. Under the conditions then existing the stipulation of the telegraph companies that they would not be responsible for mistakes unless the message be repeated was not altogether unreasonable. That the public should submit to the same one-sided regulation, now that telegraphing is no longer a novelty, is simply absurd, or worse, since it allows the companies to shirk the proper consequences of employing under paid and incompetent operators. At current rates there is no business that can better afford to furnish the best of servants and service than telegraphing, and with the present development of the art there is no more justice in throwing the presumption on the side of inaccuracy and requiring the public to pay two prices to insure the correct delivery of their messages than there would be in applying the same rule to any other service.

The baker who should offer bread at the current rates, refusing to guarantee full weight and sweetness except for double price, would soon discover that the public did not approve of that way of doing business. And the same experience would befall the tailor, shoemaker, carpenter, common carrier, or other man who should attempt to operate on the plan of non-responsibility except for double prices.

The lack of competition and the easy submission of the public to inherited customs have made it possible for the telegraph companies to continue the practice. At last, however, some one has had the spirit to dispute the right of the companies to make the law for themselves, and the United States Court at Leavenworth, Kan., has justified his action. The court held "that any rule or regulation of the company which seems to relieve it from performing its duty, belonging to the employment, with integrity, skill, and diligence, contravenes public policy as well as the law, and under it the party at fault cannot seek refuge. If it become necessary for the company, in transmitting messages with integrity, skill, and diligence, to secure accuracy, to have said message repeated, then the law devolves upon them that duty."

It is to be hoped that this decision is as well founded in law as it is in reason, and that in case of appeal the higher courts will sustain the lower. There is no reasonable excuse for inaccuracy in the transmission of telegraphic messages. The instruments make no mistakes, and it is possible, by double instrumental records or otherwise, to insure the certain delivery of the message received. It might evolve a little more care and a higher grade of operative ability; but the companies can afford that, and the public should accept nothing less from the companies than a full and exact discharge of the duty undertaken by them.

WHY BEEF IS DEAR.

The reasons given for the current high price of beef are many. The winter of 1880–81 was exceptionally severe and heavy losses of stock were suffered on the great cattle ranges of the West. The drought of the ensuing summer acted not less unfavorably upon the smaller herds of the East. The hay crop was short, and the summer and fall pasturage failed over many States; so that farmers were forced to kill their young stock. In this way, we are told, the beef supply was diminished both in quantity and quality, leaving the demand for good beef far in advance of the supply. The exportation of nearly 200,000 cattle contributed still further to lessen the beef supply for home market. Advantage was taken of the situation by speculative dealers and combinations controlling millions of capital, and by local rings of butchers and marketmen, and the price of beef was thereby raised far above what it would have been in the ordinary course of trade.

All these conditions no doubt had their influence; yet underlying them all was one of vastly greater scope and potency. Notwithstanding the enormous advance made in cattle raising during the past twenty years or so, the increased supply, even in favorable seasons, has not been at all commensurate with the increase in the demand for beef. The ratio of increase in cattle is less than that in population, so that even with no change in dietetic habits the demand for beef would tend steadily to outrun the supply. But our appetite for beef increases much more rapidly than our numbers. The marketman makes his daily rounds with fresh beef in hundreds of communities where salt pork was eaten almost exclusively twenty-five years ago; and generally throughout the country beef has largely displaced pork on the tables of farmers, mechanics, and well-to-do people. This partly because of the universal improvement in the scale of popular living due to general prosperity, but more, perhaps, to the influence of an active school of would-be health reformers who have persistently decried pork as an article of food and created a widespread and unreasonable prejudice against it.

Leaving out of consideration any possible increase in the demand for beef for exportation, we may reasonably anticipate that the home demand for beef will continue to increase as fast, if not faster, than the population does; and there can be no marked decline from the present excessive prices until the supply of beef cattle is brought up to the level of the popular requirement. It is not the prime cost of beef cattle in the field or their necessary cost at the shambles, after being driven or carried half across the continent, that chiefly determines the price of the meat to the consumer, but the single fact that the supply is relatively so meager that cattle-raisers can ask and readily get prices which enable them to make twenty, thirty, even fifty per cent profit per annum on the money invested, selling for six cents a pound, live weight, cattle which cost two cents a pound to raise.

Composition and Setting of Cements.

Mr. H. Le Chatelier, who has for some time been making experimental researches into the composition of the slow setting cements known as Portland, and also into the theory of their setting, has recently presented a paper on the subject to the French Academy of Sciences. He finds that the effective elements of these cements are, primarily, a calcareous peridot, $SiO_2 2CaO$, and secondarily, one or more aluminates and ferrites of lime.

On another hand, as concerns the successive phenomena of the setting of cements, he found the following facts by observations with the polarizing microscope: The action of water produces several compounds. The one of these which plays the chief role in the definite hardening crystallizes in hexagonal plates analogous to those of hydrate of lime, CaO,HO. This was not collected in sufficient quantity to determine its composition. At any rate, it is a product derived from calcareous peridot, and is, in fact, much more abundant in those cements that are exclusively formed of this silicate and not aluminous.

There are also formed (but only in aluminous cements) long needles, which are interlaced in every direction, and the number of which in quick-setting cements is very great. These crystals, when exposed to dry air, become dehydrated and undergo considerable contraction; and when heated in water at 50° C., break into fragments and become reduced to a powder. They result from the action of water upon the tricalcic aluminate. The author ascertained that the latter body, $Al_2O_3 3CaO$, dissolved in pure water in the proportion of 3 grammes per liter, and in larger proportion in salt water, although in this case it became partially decomposed.

These remarks explain the differences that have been observed in practice between slow setting and quick setting cements that are always very aluminous.

Calcareous peridot possesses a remarkable property which ought to give a key to a quite frequent phenomenon in the manufacture of cements. Heated up to the melting point of soft iron, then allowed to cool progressively, it exhibits itself first in the form of a semi-translucent stony matter; then the mass disintegrates and finally becomes reduced to an impalpable powder formed of *debris* of crystals. The inequality in the dilatation of the surfaces brought together by the grouping of the crystals is undoubtedly the cause of the breaking. But if the crystallization, has taken place at a lower temperature, there is no grouping of the crystals, so that their symmetrical faces adhere, and there is consequently no pulverization on cooling.

Preparing for the Transit of Venus.

The organization of the parties to observe the transit of Venus on December 6 next, has been delayed in consequence of the failure of Congress to complete the Sundry Civil Appropriation Bill. The Commission has, however, selected the chiefs of parties and the stations at which observations are to be made. Of the stations in the Southern hemisphere two will be in South America, one in South Africa, and one in New Zealand. The southernmost of the South American stations is to be at Port Santa Cruz, on the east coast of Patagonia, in 50° of south latitude. The other South American station will be at Santiago, in Chili, or at some point in the interior. The exact locations of the stations in Cape Colony and New Zealand have not been fixed, but will depend upon the weather probabilities as learned by the observers after their arrival. The following men have been selected to take charge of the four parties: Lieutenant S. W. Very, U. S. N., for Santa Cruz, Patagonia; Professor Lewis Voss, of the Dudley Observatory, Albany, for Santiago, Chili; Edwin Smith, of the United States Coast Survey, for New Zealand; Professor S. Newcomb, superintendent of the Nautical Almanac, for the Cape of Good Hope.

As the parties have not yet come together, it is possible that there may be some changes in these arrangements. The principal stations in the United States will be four in number; namely, Cedar Keys, Fla.; San Antonio, Texas, and Fort Thorn, New Mexico. It is expected that they will be in charge of Professors Hall, Harkness, and Eastman, of the Naval Observatory, and Professor Davidson, of the Coast Survey. The stations to be established by European governments in this part of the world are as follows: Germany, at Hartford, Conn., and Aiken, S. C.; France, one in Florida, one at Martinique, one in Mexico; Belgium, one in Texas; Great Britain, one at Bermuda, one in Jamaica, and one at the Barbados. The American observers will depend chiefly upon photography, which is their strong point, the American photographs taken at the last transit being the only ones which were serviceable. The Germans depend upon the heliometer, and the French and English and Belgians upon contact.

New Hybrid Silk Moth.

Mr. Alfred Wailly, whose reports on silk-producing and other Bombyces reared by him will be found in THE SCIENTIFIC AMERICAN SUPPLEMENT, has submitted to the Council of the Society of Arts, London, specimens of cocoons and moths of a new silkworm, which he has reared by the crossing of *Attacus* (*Antheræa*) *Roylei*, female, the Himalayan oak silkworm, *Attacus* (*Antheræa*) *Pernyi*, male, the North China oak silkworm. The resulting hybrid is larger than either of the parents. Mr. Wailly writes that "the larvæ of the hybrids were reared with the greatest success in France, Germany, Austria, England, Scotland, and United States of North America, and everywhere splendid cocoons were obtained. This year (1882), in April and May, the moths of this hybrid emerged from the cocoons in equal proportions of male and female, all perfect insects, which paired with the greatest facility." He concludes by saying: "Contrary to what has taken place with the crossing of different species of silk producing Bombyces, I have this time produced a new species, which is larger, stronger, and I think superior in every respect to the parent species, and susceptible of reproduction."

To make plaster of Paris hard enough for a mould for metal, use ten per cent of alum in the water used for mixing the plaster.

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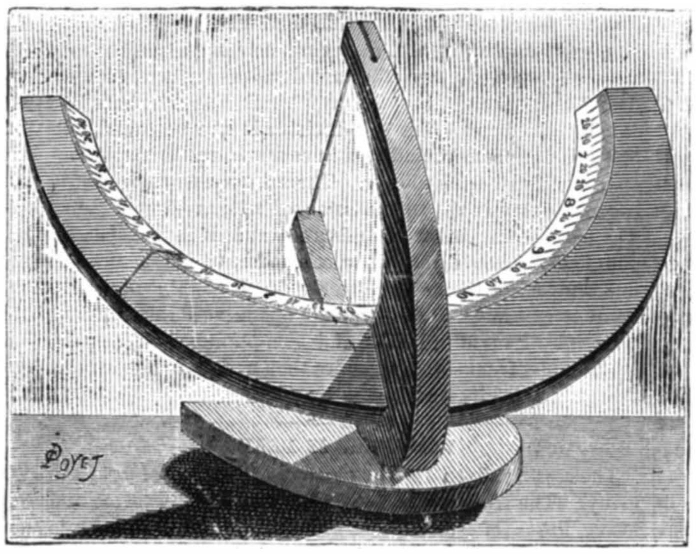
A NEW SUN DIAL.

A correspondent of *La Nature* communicates to that journal the following description of a sun dial to be used as a regulator in the house, the instrument being placed in the window when it is desired to ascertain the time.

It consists of three parts, which may be easily disconnected by the removal of screws from two of them. The form, which is purely geometrical, comprehends the right line, the circle, and the ellipse. It is of the equatorial kind—the only one that is capable of giving exactness. In spite of its small size, the hour may be read on it from minute to minute as on a watch. The dividing lines indicate the even minutes, while the odd minute is given when the shadow falls between two divisions, its passage through the interval having an appreciable duration of only fifteen seconds. In selecting this form it has been the author's object to obtain sensitiveness. The stability of the style prevents all danger of the instrument getting out of order. The instrument represented in the accompanying engraving was tried and found to be exact to a quarter of a minute, from seven o'clock in the morning to noon. The error, if there was any, diminished on approaching noon, when it became nil.

To make use of the apparatus, a window is selected which receives the sun. Then the exact hour is obtained from a watch, or by other means, and marked on the dial, account being taken of the difference between the true hour and the mean hour; this being indicated in a table glued under the base. Then the position is regulated by means of leveling screws. It is requisite (1) that the midday line, the style, and a leaden wire shall be in the same plane, and that (2) the style be parallel with the axis of the earth, or make with the horizon an angle equal to the latitude of the place. When the dial has been regulated at the place selected a datum point is made there. It is more convenient to fix a very horizontal shelf on three screws, or to cause the dial to abut against a piece of wood worked into the form of a square, which shall mark the angle that the apparatus makes with the line of the window. We shall always be certain then to put the dial in the same place. By this regulator watches may then be set with all security. Since the invention of clockwork solar instruments have possessed no utility, except as regulators, on condition that they were instruments of precision. The exact hour, since the existence of railways, has become a social necessity.

This system of sun dial, when made of iron, is especially adapted for public uses in temperate regions. For such purposes it is only necessary to fix the base of the dial against a wall, point downward, and turn up the figures. Thus, a sun dial of 1·3 meters diameter, fixed at 3 or 4 meters above the ground, would carry divisions spaced 6 millimeters apart, which would make them perfectly visible. It would present every guarantee of precision, solidity, and durability. If the principal divisions were either hollowed out or formed in relief it would be easy to repaint the instrument. At the side of it there might be placed a table of corrections.



PERAUX'S SUN DIAL.

A Natural Copper Plating Bath.

Two years ago, at a mine operated by Wm. Utter, at Campo Seco, near Milton, water came in and work stopped. To keep the large iron-bound and iron-bailed bucket used to hoist rock from drying up and falling to pieces it was let down into the water. Next season when it was drawn up, lo, a miracle! It was copper-bound and copper-bailed. From this has sprung quite an industry, and the mine has been sustaining itself from ore water ever since. The water contains an acid which has the property of taking into solution the particles of iron thrust into it, and it has also copper in solution which is let go, particle by particle, as the iron is picked up. It is a simple chemical exchange, and this mine may make another profit still if it will get another chemical into the water which will make the acid lay down the iron which, as a black flood, the water carries down into the Stanislaus River. The copper industry consists in taking bundles of scrap iron and old tin to the mine, where it is thrust into vats of water caught up, in which the metals are soon changed to copper, the residue of the iron taking the form of a black stream and flowing away. To make sure of making the water swap all its copper for iron, which it is glad to do without boot, one vat is placed below another down the bank to the river, and when the water escapes it has eaten its fill of iron and left pay for its meal in genuine copper.—*Stockton* (*Cal.*) *Mail*.

Telephonic Sounds.

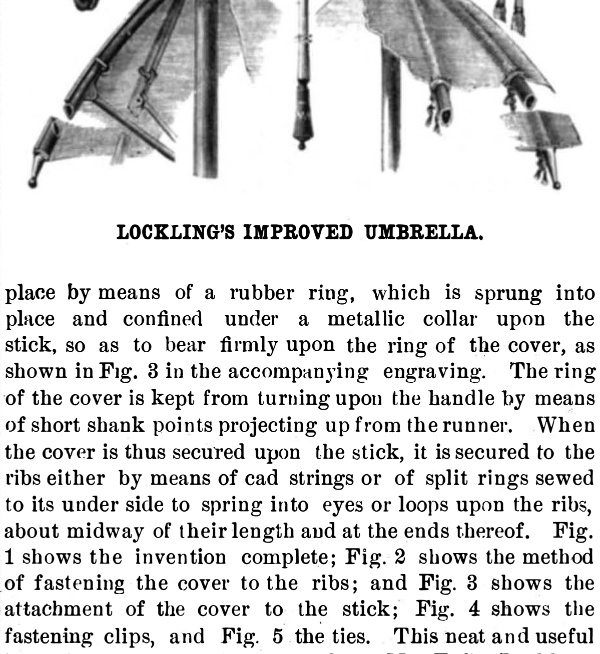
The *Operator* says: "Mr. Nat. G. Warth, manager of the Midland Telephone Company, at Gallipolis, O., writes: 'Please give some one the chance of explaining this phenomenon. This morning early, while in temporary communication over a Western Union wire with Major R. B. Hoover, at Pomeroy, Ohio, twenty miles away, I could distinctly hear the croaking of frogs and the singing of birds. The wire passes through dense woods, and along large streams between the two points. There were only the two sets of instruments in circuit. The sounds certainly were taken up and transmitted from some point between us. Now, by what law could this occur? Could the sound have been induced by a damp atmosphere?'"

The Arlberg Tunnel.

The length of the Arlberg Tunnel will be 6·382 miles. The culminating point will be 2·611 miles from the eastern extremity, at an altitude of 1,332·63 yards above the Adriatic. The work was begun in June, 1880. Two perforators are used; at the eastern end the Ferroux machine, which was employed in the St. Gothard Tunnel, acting by percussion and moved by compressed air; at the west end is the Brandt machine, which is moved by water under pressure, and drills by boring. It had given excellent results at Pfoffensprung, upon the Swiss side of the St. Gothard, and the inventor guaranteed an advance of at least 6 feet 4 inches per day, a guarantee which has been largely exceeded. The simultaneous employment of the two engines is especially interesting, since it will allow a comparison under identical conditions, and will have a great influence upon the choice of methods in the piercing of future tunnels. The ventilation will be effected by a separate apparatus, distributing air under a low pressure, through pipes carried into the neighborhood of the workmen.

DETACHABLE UMBRELLA AND PARASOL COVERS.

The engraving shows an improvement which permits a quick, ready change of the cover of a parasol or umbrella, so that with a single frame a number of covers of different materials and variety of colors may be used. It has the special advantages not only of economy, by enabling a worn-out cover to be readily replaced, but of enabling ladies to provide themselves with parasol covers corresponding with each change of suit. The interchangeable covers adapted to fit a single frame are slipped over the top of the stick of the frame, the aperture in the cover passing over the end of the stick being re-enforced with a ring of leather. This ring fits down upon the notch-plate and is held in



LOCKLING'S IMPROVED UMBRELLA.

place by means of a rubber ring, which is sprung into place and confined under a metallic collar upon the stick, so as to bear firmly upon the ring of the cover, as shown in Fig. 3 in the accompanying engraving. The ring of the cover is kept from turning upon the handle by means of short shank points projecting up from the runner. When the cover is thus secured upon the stick, it is secured to the ribs either by means of cad strings or of split rings sewed to its under side to spring into eyes or loops upon the ribs, about midway of their length and at the ends thereof. Fig. 1 shows the invention complete; Fig. 2 shows the method of fastening the cover to the ribs; and Fig. 3 shows the attachment of the cover to the stick; Fig. 4 shows the fastening clips, and Fig. 5 the ties. This neat and useful invention was recently patented by Mr. T. D. Lockling, Panama, United States of Colombia.

Peculiarities of the Great Michigan Fire.

A correspondent of the *Fireman's Journal*, who has lately gone over the territory devastated by the great fire in the forests of Michigan last fall, says his observations are conclusive that phenomena aside from the ordinary conditions of combustion were developed. In the first place the fire created at least two veritable storm centers which had the essential features of storms, and especially the spiral winds. The evidences are confirmatory of the belief that this storm center, after it became fully developed, consisted of a heated body of air or gas in a state of combustion, which was constantly fed by the smoke and vapor driven to the center by the whirling winds and the gases generated in the combustion of the pines and other resinous woods. This body of air, or burning gas, if it may be so called, by its heat acquired an ascensive force, but by the rapid forward motion of the fire was sucked forward and devoured, actually preceding the fire proper. It is evident that this body was of intense heat, possibly as great as 400° Fahr., at which point oxygen and carbon unite. That such a body of luminous vapor existed, detached from the fire, is asserted by many who saw it from a distance, and by those who were under it, but who escaped from the fact that it passed above their places.

The idea is further sustained by the fact that the fire jumped whole patches of inflammable slashings, and alighted beyond, lifting and falling in its forward motion like a balloon touching the earth. Fences in the center of broad fields burst into a blaze as if by explosion, and others nearer the fire escaped. A man in fighting the fire took off his trowsers, fearing they would catch fire and burn him up, and left them in a furrow in the middle of a field remote from any combustible material. When he went to get them he found them burned, and six quarter-dollars that were in the pocket melted together. A set of spoons were served the same way at another place.

Mrs. Lock and five children were burned to ashes, nothing but their bones remaining in the middle of the road, one hundred feet from any heavy timber. Green timber was dried and burned, and perhaps the most conclusive evidence was the apparently spontaneous appearance of fire in stumps and fences when no sparks were falling. These blazes appeared of white light and indicated a chemical union of carbon and oxygen. Another general feature is the fact that the fire appeared to move forward in parallel lines of varying width, and that in these lines everything was burned, and frequently to ashes. At the edge of the track a fence would be burned square off, just as though it had been cut or sawed perpendicularly; a house would be taken and the barn left; a wagon and a fanning mill were within five feet of each other, and the wagon was burned to ashes and the fanning mill not charred. It would be impossible, under ordinary circumstances, to burn a wagon without piling combustible material over it, but of this nothing but the iron was left.

Finally, the storm and fire disappeared simultaneously; that is to say, the fire was dependent upon the storm, or secondary to it—that it was prevented from lingering in the track or from burning sideways. In from two to three hours the fire was practically out where it had passed, indicating that the prime cause of the rapid combustion was in the storm which had passed, and which passing, perhaps, carried in its wake a condition of atmosphere opposed to combustion. This hypothesis explains pretty much all the phenomena except the balls of fire, which exactly correspond with what is known as "ball lightning," but which is a form of electricity wholly disputed by some, but recognized by Professor Loomis.

The statements of Ballentine and Kabocké are confirmatory of this ball lightning idea, and contradictory of the idea that these lights arose from the intense heat, or they themselves could not have survived it. Other statements are to the effect that this ball of fire fell on the ground and exploded, running in all directions. This is explained by some who were not present, who say that it was but the resinous cones of the pine ignited, carried by the wind, falling, scattering the burning pitch about them; but it should be remembered that those people who saw this phenomenon are men who have lived amid forest fires all their lives and have seen all the ordinary phenomena, and are not of a class exactly visionary or imaginative. It is fair to assume the possibility of electrical phenomena incidental to this fire storm, both from the fact that it was a great commotion in the elements and because it differed from a storm only in the facts of the absence of rain and presence of fire.

Detection of Fusel Oil in Distilled Liquors.

Fusel oil consists chiefly of amylic alcohol, and although the latter differs very much in taste, smell, and physiological properties from ordinary alcohol, its presence in small quantities in brandy, whisky, etc., is not easily detected. The estimation of the quantity present was scarcely possible. L. Marquardt, of Hamburg, believes that he has solved this problem. Without entering into the details of the quantitative analysis, which is exceedingly tedious, we will only say that his process consists in first extracting the fusel oil with chloroform, washing thoroughly, and then oxidizing the amylic alcohol to valerianic acid by means of bichromate of potash and strong sulphuric acid at 85° C. The odor of the acid is easily recognized.—*B. B.*

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TRANSMISSION OF MOTIVE POWER BY RAREFIED AIR.

Manufacturing on a small scale, which numbers in Paris so many representatives in what are called workers at home, is still in search of a small and economical motor, which shall be easy of installation and simple of operation, without any special *personnel*, and unaccompanied by any annoyance, for either him who employs it or for his neighbors.

A small and economical motor, presenting all the advantages just enumerated, would work a transformation in the small industries, which, up to the present time, have been obliged to perform by hand a large number of operations that an ever ready motive power would permit of doing by machinery. The solution of the problem lies in the distribution of such power to houses, and solutions up to the present have not been wanting; for water under pressure, illuminating gas, compressed air, and electricity have already received a certain number of applications, or have been submitted, with this end in view, to some experimentation. We have no desire to pass in review the advantages and disadvantages special to each of these modes of distribution; for our design is to make known now a new champion which has entered the contest open between these different systems, and whose first passes are not without interest. This new system is *rarefied air*, or the *pneumatic transmission* of power.

In qualifying this system as new, we should be understood as speaking of the application to a *distribution* of motive power, and not of the pneumatic system itself. It is now nearly two hundred years ago that Denis Papin spoke of it in the Acts of Leipzig (*Acta Eruditorum*, Lipsiæ, 1688). In another work, which appeared at Cassel in 1694, this same individual showed the advantages that would accrue from being able to *transmit* a power, from the point where it is disposable to that at which it can be utilized, by means of a relatively small tube; and he indicated the use of thin lead for the manufacture of such a tube, remarking that it would never contain any water. The authors of the system that we are about to describe, however, make no pretensions to priority, but, on the contrary, pay homage to the genius of one of our most illustrious compatriots. Their sole aim has been to develop Papin's idea by applying it to the *distribution* of motive power for small manufacturers. The need of such a power, which was far from being felt in 1688 or 1694, is at present becoming more and more imperative.

The pneumatic system consists, in principle, in establishing a line of pipes, in which a certain amount of vacuum is kept up by means of powerful pumps located at a central establishment. This piping terminates, as with water and gas pipes, at the house of each subscriber, where it receives the atmospheric air whose pressure is more elevated, and which effects the work by traversing an appropriate motor.

Central Works.—The power of the engines located at the central works must be proportioned to the extent of the pipe line, and to the total power of the motors to be supplied; friction, loss of charge, leakage, etc., being taken into the account. The *quantity* of air to be extracted from the pipes in order to keep up a pressure proper for the good performance of the receivers is equal to the quantity that enters therein through the different motors at each moment in action; but, as a consequence of expansion, the *volume* to be extracted is about four times greater than that occupied by the air at atmospheric pressure. The vacuum kept up in the system of pipes is about 75 per cent, or about 57 centimeters of mercury, or 7·75 meters of water.

The extraction of one cubic meter of air, at the mean pressure of the atmosphere, requires a theoretic power of 14,310 kilogrammeters. In the installation for study, made on Boulevard Voltaire, the pump is run by a belt; but there will be an evident advantage in fixing the rod of the pump on the prolongation of the piston of the steam engine, in an installation which is established specially for an application of the system.

The System of Piping.—The piping is calculated for an anticipated extension of one kilometer distance from the central works, and for losses by friction in the mains not exceeding 3 per cent. The pipes may, according to circumstances, be laid in the sewers or in trenches. The installation for study is made in Boulevard Voltaire and Avenue Parmentier. The distance is about 600 meters, and the piping is 6 centimeters in diameter.

In practice, it is proposed to employ cast-iron pipes for the mains and principal branches iron ones for the secondary branches, and lead pipes for service.

The joints of the iron pipes laid in Boulevard Voltaire are of rubber, and have given good results, as the pressure is not excessive, and elongation and contraction of the pipes is almost null, owing to the slight variations in temperature in the trenches in which they lie.

The Motors.—The receiving apparatus furnished customers must present very peculiar features. By the very fact of the nature of the power distributed, the motors must be scattered in great numbers among consumers without being subject to continual surveillance and keeping in repair by the company. The type of motor, then, should be as simple as possible, without any delicate parts, and should be capable of being taken apart and put together again in a few instants, and, finally, the price should be moderate, and the space occupied by the apparatus should be small. All the motors applied up to the present time have been oscillating ones. They have answered requirements perfectly, and have not necessitated the least repair during several months of service.

Fig. 1 represents one of these machines of the 5 kilogrammeter model. An analogous machine of smaller size actuates a sewing machine (Fig. 2), without any change being requisite in the parts of the latter, as constructed for being operated by a pedal. The operation of these machines is analogous to that of oscillating steam engines, the air at the pressure of the atmosphere acting in the place of steam, and a vacuum being effected on the side of the escapement. The machine is of a double-acting and expansion type. Admission ceases at about three-eighths of the piston's travel, and the volume of air before and after expansion is in the ratio of 1 to 2·66. Expansion being incomplete as a consequence of the practical ratio adopted, the work effected per cubic meter of air is only 13,500 kilogrammeters, the theoretic loss thus not exceeding 6 per cent. The *practical* performance, that is to say, the ratio of theoretic or utilizable work, measured by the brake, increases rapidly with the power of the motor. With the 3 to 5 kilogrammeter sizes, the practical performance varies between 0·40 and 0·50, while it easily attains 0·60 in machines of 25 kilogrammeters.

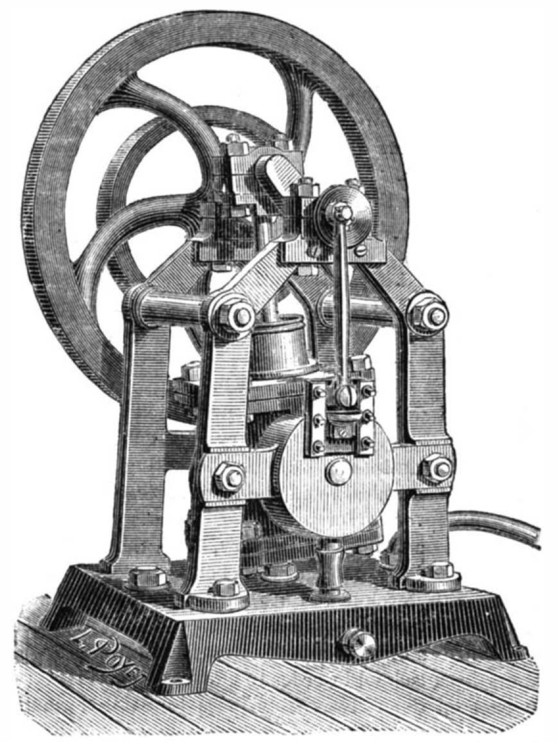

Fig. 1.—RAREFIED AIR MOTOR FOR DOMESTIC USE.

The velocity of the oscillating machines also has an influence on the performance, as well as on the absolute work effected in a unit of time. Thus, for example, in one experiment, the performance did not reach 0·40 at a speed of 145 revolutions per minute, while it exceeded 0·54 on reducing the speed to 120 revolutions. In this second case the motor, on revolving at a less speed, furnished more work.

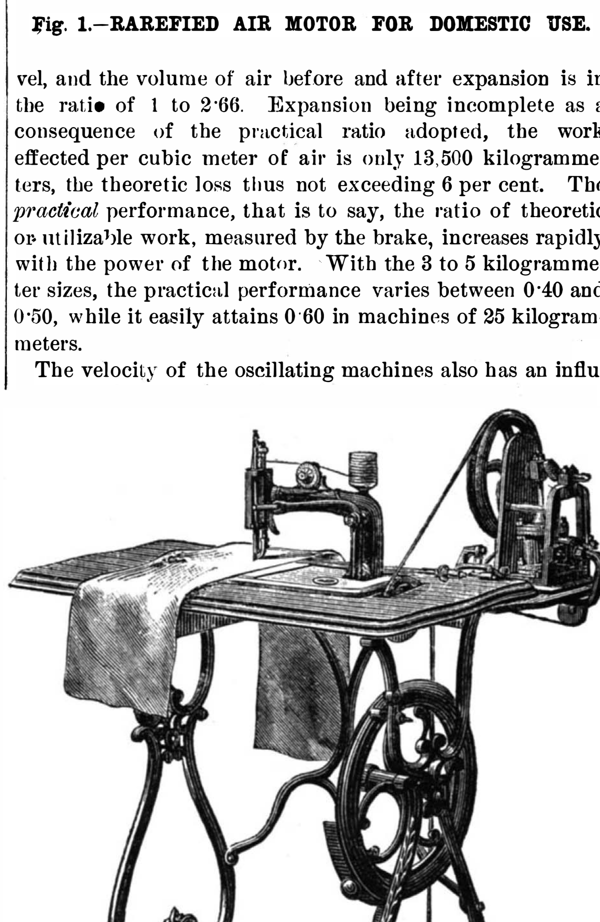

Fig. 2.—RAREFIED AIR MOTOR APPLIED TO A SEWING MACHINE.

In a new system of rotating motor now under study, phenomena are discovered that are slightly different. The performance diminishes with the speed, but the quantity of work effected increases with the latter.

To avoid the introduction of lubricating oil into the service pipe, which might, in the long run, retain atmospheric dust and produce an inevitable obstruction, the motors are mounted upon hollow bases (Fig. 1). The air that has just operated rushes into this base through a wide and short aperture. This empty space, being always in communication with the conduit, performs the role of an intermediate reservoir that is always kept at a medium degree of rarefaction. This receptacle retains the oils that are deposited at the bottom, and allows of their extraction from time to time through the removal of a simple screw-plug located at the lowermost part.

Each motor is so arranged as to run at a medium speed, according to the application for which it is designed, and deviates but little from it in practice. Under these circumstances, the work by all is perceptibly constant, and there results from this one of the simplest of methods of making the consumer pay in proportion to the use he makes of the machine.

It is only necessary to count the number of revolutions made by the motor during a given length of time (a day, a week, or a month) by means of a very simple counter in order to fix the price that the customer must pay, according to the type of motor furnished him. Changes of speed are very easily brought about by opening the cock that lets in the air, more or less, and a stoppage by closing the same cock completely. The maximum work is obtained by opening the cock to its full extent.

In sewing machines, wood and metal lathes, etc., it is convenient to utilize for this purpose the pedal which formerly served to put the machine in operation. The hands of the operator are thus rendered free, and the operations of setting in motion, slackening the speed of, and stopping the motor are easily disposed of.

In the experimental installation of Boulevard Voltaire, we have seen a series of machine tools actuated by a distribution established on the principles that we have just explained, and consisting of sewing machines, drilling machines, wood and metal lathes, sausage choppers, etc. All these tools were running with the greatest regularity, and those who were employing them were entirely satisfied with their operation. It is well to remark that the system of distribution by rarefied air is in reality a *negative* one, seeing that nothing is sent to the customer, and that the air is withdrawn from the room in which the motor is located. This latter feature proves very advantageous, moreover, in that it effects a ventilation and aeration of the apartment.

Although the merit of these labors and experiments reverts to the technical commission which has presided over their installation, we think that in all justice a large part of it ought to belong to Mr. V. Tatin; for it is due to his intelligent initiative and profound mechanical knowledge that the Société Civile d'Etudes has been enabled to make the application of the system whose success we now record.—*La Nature.*

Indelible Stamping Ink.

The ordinary stamping ink made by diluting printing ink (which is made of lampblack and linseed varnish) with boiled linseed oil stands pretty well if enough is used, but when poorly stamped will wash off. Dr. W. Reissig, of Munich, has recently made an ink for canceling stamps which is totally indelible, and the least trace of it can be detected chemically. It consists of 16 parts of boiled linseed oil varnish, 6 parts of the finest lampblack, and from 2 to 5 parts of perchloride of iron. Diluted with one-eighth the quantity of boiled oil varnish it can be used for a stamp. Of course it can only be used with rubber stamps, for metallic type would be destroyed by the chlorine in the ink. To avoid this the perchloride of iron may be dissolved in absolute alcohol, and enough pulverized metallic iron added to reduce it to the protochloride, which is rapidly dried and added to the ink. Instead of the chloride other salts of protoxide or peroxide of iron can be used. The iron unites with the cellulose and the sizing of the paper, so that it can easily be detected even after the ink has all been washed off. Sulphide of ammonia is well adapted to its detection.

Values of some Southern Fibers.

The *Southern Cultivator* says that Mr. Richard Goode, of Melbourne, Florida, recently sent to London a number of sample bales of fibers grown in that State. They found ready sale, the dealer's report of quality and value running as follows:

Agava, long samples. Is like a superior sisal hemp, color and quality both being good. Value, $145.80 per ton.

Agava, short sample. Very soft, fine fiber, and worth $170.60 per ton.

Sisal, good length and color. Valued at $136.08 per ton.

Aloe, useful, clean fiber, but rather short. Worth $136.08 per ton.

Yucca, or *Bear's Grass*, a useful fiber, but not so well prepared for market as the other samples. Value, $136.08 per ton.

A Submarine Metal Detecter.

A new application of the electric balance is seen in an instrument devised by Captain McEvoy, of London, for use in finding torpedoes, electric cables, lost anchors, chains, sunken vessels, or other metallic objects under water. The principle on which this invention is constructed is that of the induction balance of Professor Hughes.

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PROGRESS OF THE EAST RIVER BRIDGE.

Marked progress has been made toward the completion of the East River Bridge since our last illustration of this great engineering work. All of the floor beams have been placed, the foot bridge is removed, the approaches have been brought almost to completion, and the elevated super structure has been commenced and is now progressing, having reached a distance of ninety to one hundred feet each way from each tower, and the overfloor stays are correspondingly advanced.

The bridge, as is well known, is designed to carry three kinds of load: the outside roadways being for wagon traffic, the middle one for a promenade, with the railway tracks on either side of it, and between it and the roadways.

The approach on the Brooklyn side differs from the New York approach in having iron street bridges at all of the streets. The New York approach has but one iron street bridge, and this is located at Franklin Square. All the other streets are spanned by massive arches of masonry. The bridge at Franklin Square presents several engineering difficulties of more or less importance, which may be enumerated as follows: First, the bridge is longest on the upstream side; second, it is skewed at both ends; third, it is on an incline; and fourth, it must be adapted to three quite different kinds of load. The form and inclination of the bridge necessitates a great variety of fastenings, of different angles and shapes, and call for somewhat complicated calculations, and a large number of drawings.

The total weight of metal in this bridge in round numbers is one thousand tons. Of this 1,658,279 pounds are wrought iron, 82,092 pounds steel, 27,440 pounds steel pins, 146,891 pounds cast iron. The width of the bridge over all, 88 feet. Length on the longest side 206 feet. Length of longest truss 198′ 5″; length of shortest truss 163′ 10″. The outside roadways will be 16′ 7″ wide between fenders. The two railroad ways will be 12 feet each. The promenade will be 17′ 7″ wide. The parapet is of unique design, and harmonizes with the character of the masonry parapet on the rest of the approach.

The Brooklyn approach intersects at an angle of about 45°, York, Main, and Prospect streets, over which it is carried by wrought-iron bridges composed of riveted plate girders The bridges rest upon stone abutment walls, and have a grade of 2·8 per cent.

The York street bridge consists of six, single web, riveted plate girders, 9 feet deep and 85 and 86 feet long, having lattice cross-girders riveted to them, these latter supporting longitudinal rolled floor-beams. Buckled plates cover the outer floor-beams and are riveted to them. The bridge seats are 42 feet above the street level.

The Main street bridge is similar to the York street bridge, and is about the same length. The mean height of the bridge seats above the level of the street is 23 feet.

The approach where it crosses Prospect street is curved, the mean radius being 260 feet. The Prospect street bridge has six continuous girders, 2 feet 6 inches high, in three spans, one continuous girder in two spans, and six single girders. The continuous girders are parallel to each other, but the other or outer girders are placed so as to conform as nearly as possible to the curve of the approach. The cross girders of this bridge support, as in the other bridges, the longitudinal rolled floor beams. This bridge is supported by two stone abutment walls and two rows of columns, located at the curb lines of the street. All the girders of this bridge, both main and cross, are of the single web, riveted plate type.

The total weight of metal in the street bridges of the Brooklyn approach is as follows: York street bridge, 561,338 pounds; Main street bridge, 551,342 pounds; Prospect street bridge, 185,430 pounds.

The following is a table of the principal dimensions of the bridge:

Construction commenced January 2, 1870.
Size of New York caisson, 172 x 102 feet.
Size of Brooklyn caisson, 168 x 102 feet.
Timber and iron in caisson, 5,253 cubic yards.
Concrete in well holes, chambers, etc., 5,669 cubic feet.
Weight of New York caisson, about 7,000 tons.
Weight of concrete filling, 8,000 tons.
New York tower contains 46,945 cubic yards masonry.
Brooklyn tower contains 38,214 cubic yards masonry.
Length of river span, 1,595 feet 6 inches.
Length of each land span, 930 feet, 1,860 feet.
Length of Brooklyn approach 971 feet.
Length of New York approach, 1,562 feet 6 inches.
Total length of bridge, 5,989 feet.
Width of bridge, 85 feet.
Number of cables, 4.
Diameter of each cable, 15¾ inches.
First wire was run out May 29, 1877.
Cable making really commenced, June 11, 1877.
Length of each single wire in cables, 3,578 feet 6 inches.
Ultimate strength of each cable, 12,200 tons.
Weight of wire, 12 feet per pound.

Each cable contains 5,296 parallel (not twisted) galvanized steel, oil coated wires, closely wrapped to a solid cylinder, 15¾ inches in diameter.

Depth of tower foundation below high water, Brooklyn, 45 feet.

Depth of tower foundation below high water, New York, 78 feet.

Size of towers at high water line, 140 x 59 feet.
Size of towers at roof course, 136 x 53 feet.
Total height of towers above high water, 278 feet.
Clear height of bridge in center of river span above high water, at 90° Fah., 135 feet.
Height of floor at towers above high water, 119 feet 3 inches.
Grade of roadway, 3¼ feet in 100 feet.
Height of towers above roadway, 159 feet.
Size of anchorages at base, 129 x 119 feet.
Size of anchorages at top, 117 x 104 feet.
Height of anchorages, 89 feet front, 85 feet rear.
Weight of each anchor plate, 23 tons.
Engineer, Col. W. A. Roebling.

The depots at the ends of the bridge are to be elaborate structures of glass and iron. The one on the New York side is to be 260 feet long and 59 feet wide, with a platform on the bridge end 70 feet long.

The cars will pass through the depot, and are shifted from one track to the other on switches between the depot and end of the approach.

We are informed that Colonel Paine is engaged on a system of wire rope propulsion for the railway crossing the bridge.

For much of our information we are indebted to Messrs. C. C. Martin and F. Collingwood, engineers in charge of the approach work.

HENRI GIFFARD.

Henri Giffard was one of those privileged men whose works honor not only their country but entire science. The light of such an intelligence may be extinguished, but the rays that it has emitted will endure forever. The name of Giffard will never be forgotten.

Born at Paris on the 8th of January, 1825, the celebrated engineer pursued his studies at Bourbon College, and from his earliest youth developed in his brain a genius for mechanics. He has often told us that in 1839 and 1840, when he was only fourteen or fifteen years of age, he found a way of escaping from school in order to go to see the first locomotives pass on the railway from Paris to Saint Germain. Two years afterward he entered as an employe the shops of

HENRI GIFFARD.

this same railway; but his ambition was to drive a locomotive for himself. He succeeded therein, and had the pleasure of taking the first trains of the railroad over the rails with as great speed as he could.

Henri Giffard was only eighteen years old when he began to devote himself to aerial navigation. It was not long ere he made some ascents in a balloon, and it was by joining practice with theory that he was led to realize his great experiment of 1852.

This experiment was one of the most memorable in the scientific history of our epoch. The young engineer, amid a host of material difficulties, had constructed an elongated balloon 44 meters in length by 12 meters in diameter. This aerial vessel, which cubed 2,500 meters, was provided with a screw propeller actuated by a 3-horse power steam-engine. Giffard rose alone into the air, proudly seated on the tender of his engine, and was followed in space by the applause of the spectators. He succeeded in perceptibly turning aside from the line of the wind, and demonstrated that an oblong balloon, the only kind that can be steered with advantage, offers perfect stability, and obeys with great precision the action of the rudder. The road for aerial navigation by oblong balloons was thus marked out. In 1855, the bold mechanician renewed this experiment in another and not less remarkable balloon. But the wind, at the time, was too high to allow of a successful result to the experiment.

Attempts of this nature were very expensive and brought no return. Giffard then gave up balloons for the moment in order to construct a new style of fast-speed steam vessels, and to finally invent the *injector* which made his fortune. Giffard became a millionaire over and over again, but never ceased to be the modest and simple worker such as he was known in the beginning of his career. Balloons remained the objects of his constant thought and of his most assiduous labors. At the time of the Paris Exhibition of 1867 he constructed the first steam captive balloon, and, the year following, he brought out another one at London which cubed 12,000 meters, and which necessitated an enormous outlay, for the material cost more than 700,000 francs, an amount that the projector lost entirely without uttering a single complaint. The eminent engineer never regretted the expense of this experiment, as costly as it was, because, as he said, some profit would always be derived from it.

Giffard was thus led gradually to originate the great captive balloon of 1878, a real monument to aerostation, and which may be called one of the marvels of modern mechanics. Every one still retains a recollection of that globe of 25,000 cubic meters, which lifted into space forty excursionists at once, and opened up a panorama of Paris to more than thirty thousand persons during the time of the Exhibition. All was new in this colossal work, and aerostatics was transformed therein in every detail. The impermeable tissues, the preparation of hydrogen in large quantities, the modified and improved details of construction, all this our engineer had conceived, tried, and realized. His power of conception was remarkable—he thought out everything, he foresaw all. He was an emeritus experimenter, an eminent calculator, a man of exceptional ingenuity, and a mechanician out of the ordinary line. The grand aerostatic constructions to which he had so boldly applied himself should have permitted him to realize the dream of his entire life, to take up again his experiment of 1852, and to give finally to the world a solution of the problem of directing balloons. He had conceived an imposing project, that of constructing a balloon of 50,000 cubic meters, provided with a very powerful motor actuated by two boilers—one heated by gas from the balloon and the other by petroleum. The steam formed by combustion was to be received in a liquid state in a condenser of wide surface, so as to compensate for losses of water from the boiler. How many times has not our regretted master given us in detail a description of this monitor of the air. All was calculated, all was ready, even to the million which was to permit him to put his ideas into execution, and which was always held by him in reserve in some one of the large banking houses of Paris. Other projects were yet germinating in his brain—a steam carriage, a high-pressure locomotive, and a high-speed boat—powerful conceptions, studied out with perseverance and stamped with the seal of genius.

But, beyond human will and foresight, are the fatal laws of destiny, and the strongest must submit to them. Sickness came to combat the efforts of the great inventor, enfeebling his eyesight, rendering all work impossible, and throwing him into extreme grief; for there was little of the athlete in the soul of Giffard, and the idea of finding himself reduced to a state of powerlessness rendered him inconsolable. He shut himself up; and he who had so much loved light, independence, and activity lived in solitude, and gradually passed away.

In Henri Giffard, the man was not less remarkable than the engineer. He was slender and nervous, supple, agile, and very dexterous of hand. He was capable of doing anything himself, and we remember one day having surprised him in the act of taking the stuffing out of an arm chair in his parlor in order to remove therefrom a spring that he needed for an experiment, and another time we observed him making a photometer out of two pencils fixed in the cover of an almanac. He informed himself in regard to everything he desired to do through experimentation. He wrote out with minute care the results of all his researches, of all his labors, and has left innumerable manuscripts in which will be found a wealth of scientific facts.

His physiognomy was charming, and his clear, limpid eyes, full of loyalty and frankness, shone with uncommon luster. He was a fine conversationalist, was witty, and had a mind stored with incomparable technical erudition. He was reserved, and disliked the vulgarities and frivolities of the world, and so passed at times in the eyes of strangers as being cold and severe of address. Those who thus judged of him did not know him; for he had a warm heart, an inexhaustible generosity, and an exquisite delicacy. He disdained honors, and loved work above everything. An enemy to manifestations of an apparent wealth, he took pleasure in the practice of a simple and industrious life; but, when it became a question of constructing machines, the millionaire made his appearance. He has been seen to expend 30,000 francs to construct a suspended car or a gas apparatus, and several hundred thousand to construct a captive balloon. When it became necessary to aid a friend or do an act of charity, he took the gold from his coffers by the handful. He was a Mecænas to all aeronauts, and the benefactor of all those whom he knew. He gave incomes to his unfortunate friends, and owned near Paris a house to which tenants were admitted only on condition of being poor and of never paying their rent. Giffard hid himself to do good, and the good acts in which his life abounds he performed in secret.

The man whom we weep is of those whom we never forget. Whatever be the distance that separates the master from his disciples, let us promise him to make every effort to walk in his tracks to continue his good work. May his blessed name protect us! If there come hours of lassitude or weakness, let us remember that we shall only have to visit his tomb to draw new strength therefrom.—*Gaston Tissandier, in La Nature.*

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Correspondence.

Mr. Dueberg's Theory of the Moon.

To the Editor of the Scientific American:

Whatever merit Mr. Dueberg's "new theory of the moon" may have, as mentioned in your paper of July 1, his method of illustrating it is certainly curious. To quote from the article: "Supposing the moon to possess air and water, these lighter and more fluent elements of her composition would of necessity lie on the further side." For a practical illustration of this view, Mr. Dueberg suggests "a ball swinging in a circle by means of a cord; and if it be dipped in any liquid, the liquid will be rapidly accumulated on the opposite or outer side." Mr. Dueberg subjects the ball to the restraint of centripetal force—the string. He should subject each atom of water to the same restraint, and then see if it will go on the outer side.

Water on the moon is surely subject to the earth's attraction. It might be suggested to Mr. Dueberg to use a hollow ball filled with liquids of different densities, or with a liquid and a gas, and see if the lighter of them will get on the further side when swung around.

It may be that if the moon were falling toward the earth, Mr. Dueberg's fluent substances might get on the further side of the moon, but it appears to the writer that he would have to have a retarding medium to accomplish that feat.

MONROE MCCARTY.

Hot Springs, Ark., July 7, 1882.

Noiseless Alarms and Noiseless People Wanted.

To the Editor of the Scientific American:

There are many who work twelve hours per day, changing at midnight; and as far as I am acquainted with this kind of work, they depend upon some one to wake them at the right time. So, at midnight, the "caller" will stand near the window of the sleeper, and call loud enough to rouse the sleepers for a block all around. Besides this, the cook in every boarding house must get up early to prepare the breakfast, and by the time the noisy cistern pump has sounded, and the noisy alarm clock, and the noisy calls for John or Mary, with the many other sounds, the weary ones who have only slept two hours are robbed of that which is to them very life.

Now, it seems to me, if we had a silent alarm clock to set at the head of the bed, with a string to reach from the clock to the hair of the sleeper, and fastened with a pin, then a ring to be loosened by the clock at a given hour so as to slide down on the string, this would wake up the early riser without a sound; or a watch might be made with a hammer to strike out of the case, so that the watch might be placed with the hand in a glove, and when the hour arrives the hammer would strike the hand, and awake the sleeper. But how to make a noiseless cistern pump I do not see, nor do I see how Sally Ann, the cook, and John, her helper, can be improved so as to keep absolutely still. The fact is, our scraps of time are so valuable to somebody, and our habits so different, it is a sore puzzle to invent a universal crank to fit every case. I give it up, but hope some inventive Yankee will see the "p'int," and help us lazy, sleepy ones, who are much in need of help. We want a noiseless alarm clock, and a noiseless pump, and noiseless cooks, and noiseless neighbors, etc., for which we are willing to pay a reasonable price to any inventor who can get a patent.

T. O. B.

Rockton, Ill., July 11, 1882.

RULES IN THE CUTTING OF UPPERS.

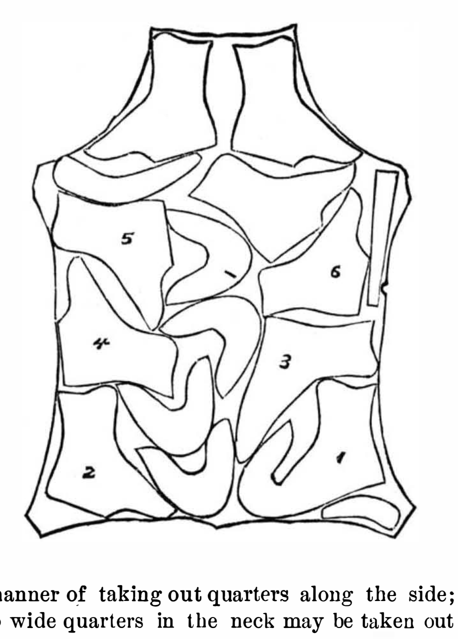
BY A PRACTICAL WORKMAN.

Rules or theoretical truths imply perfection in the materials they are applied to or embodied in, and all imperfections require them to be more or less modified to adapt them to the material. In the application of rules to the cutting of uppers, then, we must assume that skins will be perfect—free from spots, wrinkles, ruts, damages of every kind, clear and clean, at least comparatively. These we proceed to cut up in a certain regular way, which allows of very little waste. The waste, indeed, is reduced to its very smallest quantity, and so to lay on the patterns that this will be accomplished is the most difficult thing to be done. Not, however, that the thickness, firmness, or fineness of the skin in different parts is to be overlooked, for such stock is supposed to be cut into goods of the first quality, and fineness and coarseness, thickness and thinness, firmness and looseness must each go into its proper place in the upper. The finest and firmest part of the skin is along the middle, from the butt to the neck; the heaviest part in the neck, and along the side, half way between the skirt and the backbone; the thinnest in the flanks and shoulders. The heaviest or thickest part of the fine stock should go into the vamp or front part of the shoe, where the most service is required; the heavier part of the coarse into the bottom of the quarter for the same reason; the lighter and looser part into the top of the quarter or leg; while the finest and smoothest or best-looking part of *any* piece, should be where it will be most exposed to observation when worn. The skin stretches most in a crosswise direction, and this stretchiness, what there is of it, must, in the quarter, extend up and down the leg, not lengthwise of the foot.

Bearing these things in mind, and supposing that the upper is to be cut in quarters and vamps, we first, if it be a good-sized skin, take off a row of quarters along the side; then a row of vamps, following one another from the butt to the shoulder; next another row of vamps following, if, in that way, they leave just width enough at the other for a row of quarters; if not, they are turned in any direction that will best take up the space, along with a row of quarters on the further side. Frequently, it is easiest to turn the skin half way round, so as to cut the middle and remaining side together from the butt toward the neck. The neck is worked up into the wide quarters of a button-boot, these requiring to be thicker than the narrow ones, while the remaining part of the shoulder and the corners go into narrow quarters or button pieces. Some part of the neck may have to be left as too coarse, and perhaps some of the quarter or button pieces will finish up a remnant too small for any of the set of patterns used.

With patterns of a different shape, we still have to arrange them in a way to bring the toe part into or toward the middle of the skin, and the back toward the side, or turned in such a manner that no stretchiness will come in the forward part. A diagram will make the matter plainer than words.

Our pattern proves too large, or the skin too small, to show just what we first intended, but it happens to be of the right size to illustrate several things in one diagram. Nos. 1 and 2 show how patterns may be turned crosswise of the skin at the butt, where there is commonly very little stretchiness. Nos. 1 and 3 show how other patterns than quarters may be placed; Nos. 3, 4, 5, and 6 represent the



usual manner of taking out quarters along the side; while the two wide quarters in the neck may be taken out in the way represented when the stock is firm; if not, they must be turned with the foot, part lengthwise or diagonal of the skin. Two of the vamps *follow*, while the other two illustrate the liberty of placing them in any manner that may be necessary. The unoccupied strip through the neck represents a part that in India goat and kid skins is too weak to be cut across without danger, though in Tampico and Curacoa skins it is much stronger. No. 6 is a smaller-sized pattern, of the same kind as the others of that shape, used to fill a space too small for one of the larger ones. The little button-piece and tongue are, like Nos. 1 and 3, strangers to the other patterns, and brought in to fill out the remaining corners of the skin.

Few skins will cut up with as little waste as the one here represented. Even if there are no damages in them, there may be extreme thinness of the flanks, or coarseness of the neck, that cannot be worked into first-quality goods, such as are usually cut from clear stock. Wax calf and calf kid skins always have more of this kind of waste, and it is more difficult to turn the lower part of a quarter into the skirt along the belly.

In the diagram we have used women's patterns, but men's, boys', misses', or children's would require no exception to the rules, nor any different distribution of the parts of the skin. Neither, it is obvious, does a half skin—a side of grain leather, kip, or split—demand any variation. There is only more surface and opportunity in the better portions to turn patterns in a variety of ways, when advisable, or to follow out a systematic method.

Every new or different form of pattern, however, makes it necessary to study out a new arrangement to some extent, and some little experience, to ascertain what method of placing the patterns will give the best results, though not in a manner to violate any of the acknowledged rules.

The objects to be kept constantly in view are four, namely—first, to cut stock economically, or so as to obtain the greatest number of uppers from a given amount; second, to put the strongest part of the material into that part of the upper most exposed to strain in wearing; third, to put the finest or handsomest portion into the part most exposed to view when on the foot; and fourth, to so cut the material that the stretchiness of it will do the least harm.

With good stock, a regular method of placing the patterns can be studied out and closely followed, while fulfilling all these requirements. With poorer stock, we can only do the best the conditions allow.—*Shoe and Leather Reporter.*

A Cheap Electric Pile.

Mr. Alfred R. Bennett, engineer for Messrs. D. & G. Graham, of Glasgow, read before the Philosophical Society of Glasgow, on the 7th of February, a very interesting note on a new pile invented by him.

This pile is composed of an iron vessel (enameled or not), of a porous cup, and of a strip of zinc. The space between the iron vessel and the porous cup is packed with iron in small fragments, such as lathe turnings, and the porous cup is filled with a solution of caustic soda or potash.

The idea of this combination is based upon the well-known fact that iron does not rust in solutions of the caustic alkalies; and experience has shown that if a strip of iron and one of zinc are immersed in such a solution the iron becomes strongly electro-negative with respect to the zinc. It is the same with silver and gold and the metals belonging to the platinum group.

Primarily carbon is slightly more electro-negative than metals with respect to zinc; but all such superiority soon ceases on account of the absorption of hydrogen by the pores of the carbon. Iron offers peculiar advantages. It is very cheap, and its solidity permits of attaching the connecting terminal, which is something that cannot be done with carbon. It has been found, however, that an iron plate becomes rapidly polarized, because the hydrogen which is disengaged attaches itself to it and greatly increases the resistance. This difficulty is overcome by the use of small fragments of iron, because hydrogen disengages itself therefrom more readily than from a continuous surface. In order to facilitate such disengagement it is necessary to have care that the fragments be only wetted and not immersed in the solution; then the pile acquires to a high degree the faculty of preserving its electromotive power while working continuously under a feeble resistance. Under a resistance of twenty ohms the pile remains quite constant, and resumes, through rest, its electromotive power rapidly enough to permit its being employed on the most active telegraphic circuits, and for the majority of practical purposes.

This electromotive power varies with the nature of the iron, the purity of the solution employed, and the degree to which the iron is moistened by the solution.

The electromotive power of a Daniell pile being 1, that of a Leclanché is, at the most, 1·30, and that of an iron pile varies from 1·15 to 1·33. This latter figure is exceptional, and 1·23 must be taken as the mean.

Mr. Bennett's pile has given good results in the experiments that have lasted for several months.—*Revue Industrielle.*

The Symptomatology of Bright's Disease.

M. Dieulafoy lately called attention to certain symptoms of Bright's disease (parenchymatous and mixed nephritis) of which too little notice has, he thinks, been taken. The most important of them is frequency of micturition, a symptom which, although frequently associated with polyuria, may exist independently of any increase in the quantity of urine. In some cases the symptom is very troublesome; the bladder has to be emptied twelve or fifteen times a night, and twenty or twenty-five times in each twenty-four hours, and this although the total quantity of urine may not amount to a pint. This symptom Dieulafoy proposes to term pollakuria, and it may be manifested in three forms:

1. An early form may attend the commencement of the renal disease, of which it may be indeed the earliest manifestation and of considerable diagnostic significance.

2. A late form, which attends the chronic stage of the disease which has commenced acutely.

3. A form in which the symptom is attended with great pain and distress, and is accompanied by tenesmus and spasm of the sphincter ani, lasting from three to eight minutes.

Another symptom is irritation of the skin. M. Dieulafoy asserts that it is met with in one-third of the persons suffering from "albuminous nephritis," whether interstitial, parenchymatous, or mixed, and that it is especially frequent in women. This symptom is also met with in different forms. Sometimes it has the character of ordinary pruritus, and may be thus the initial symptom of Bright's disease, preceding for months any other inconvenience. It has been explained by uræmia, and has been attributed to an excretion of urea by the skin, but in one of his cases the symptom was not present, although a large amount of urea was excreted by the skin. In other cases the itching is much slighter, and is described as resembling the sensation produced by the contact of a hair with the skin.

The last symptom to which attention was directed is that which is described by patients as the "fingers going dead." It is a sensation of formication or cramp, accompanied by such pallor that the part looks altogether exsanguine. It may last half an hour or so, and then disappear entirely. Rarely both hands are affected, and when it is bilateral and partial the area is always symmetrical on the two sides. It appears to be due to a true vaso-motor disturbance.—*Lancet.*

Poisonous Washing Compounds.

Several cases of distressing if not dangerous poisoning by the use of compounds for lessening the labor of washing clothes have occurred recently among New Jersey laundry workers. The *National Laundry Journal* says that the State Board of Health are about to make examinations of the suspicious preparations, intending to prosecute manufacturers where dangerously poisonous properties are discovered.

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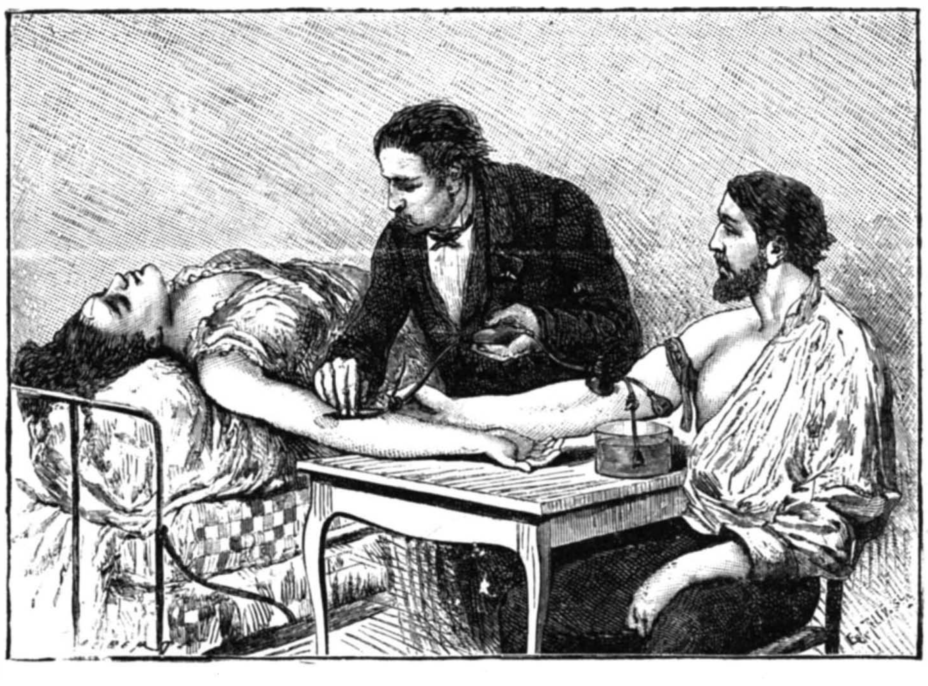
THE STEAMSHIP AUSTRAL.

The latest addition to the Orient Line of steamers, the Austral, is a distinct advance on the Orient, the first of her type, not only in respect of speed, but in the structure of the hull, the ventilation of the state rooms, the arrangements made for the importation of frozen meat from Australia, and the effectiveness of the vessel as an auxiliary to our naval force. She has been built by Messrs. John Elder & Co., of Govan, on the Clyde, under the superintendence of Mr. J. W. Shepherd, a member of the Institute of Naval Architects. Her length over all is 474 feet, her breadth 48 feet 3 inches, and her depth moulded is 37 feet. Her displacement on the load line is about 9,500 tons. She is thus 10 feet longer, 2 feet broader, and 2 inches deeper than the Orient, but, as her lines are finer, her tonnage will not much exceed that of the Orient. She is built throughout of mild steel, and has three steel decks. She is divided below the inner skin and the double bottom into nineteen separate water-tight compartments, and in the hull proper within the interior skin she is divided by thirteen water-tight bulkheads, ten of which run up to the level of the main deck. If the whole of the lower compartments were filled with water, the effect would be an additional draught to the extent of 18 inches, and if the sea got into two of them, the stability and the surplus buoyancy of the vessel would prevent her from being endangered.

Above the main deck the ship is divided into seven fireproof compartments, all in communication with the main deck; and, as the pumping power provided is equal to 2,928 tons per hour, there is ample arrangement made for flooding any of the compartments in case of fire, or extracting the water in case of their becoming waterlogged. In the event of the engines being disabled, the vessel is provided with four masts, the fore and main being square-rigged, and the mizzen and jigger having fore and aft sails, which, combined, will give about 28,000 superficial feet of canvas: thus the vessel is well under command independently of steam power. These provisions for the general safety of the vessel are supplemented by unusual care for the comfort of the passengers. The cabins are all placed within the area of the ship, with a gangway, four feet wide, running right along the vessel, outside the state rooms, and at frequent intervals across the ship. This permits each state room to be constructed like an ordinary compartment, with windows instead of portholes; and the porthole in the side of the ship may be opened even in rough weather without any fear of water entering the cabin. If a sea should strike the vessel when the porthole is open, the water will fall on to the gangway. Upon the upper deck, the gangway running round the whole of the vessel is perfectly open to the air, while it is covered above; and the passengers may promenade there with the full advantage of an open sea before them. The passage round the ship leads fore and aft on each side of the saloon, so that persons can go to either end of the ship without passing through the saloon. Besides this, there are numerous cross passages, three feet wide, between the several quadrangles of state rooms, an arrangement that offers unusual facilities for moving about the ship. The saloon is a handsome apartment, paneled with walnut and embellished with carved shields representing the arms of various nationalities. Arrangements are made for the usual long tables, but they can be also divided into sets of a dozen or even four seats. The most striking characteristic of the saloon, however, is the row of dome-shaped painted-glass windows down each side. These can be lowered at will in all weathers, because, instead of opening on to the sea, as usual, they merely admit air from the long corridors. Effective ventilation is provided for the saloon by a centrifugal fan, worked by a small steam-engine. The fan forces a continuous current of pure air into the apartment, and the foul air finds its way out through an ornamental opening above each window. The public rooms, the engine-room, pantries, and passage ways are lighted by the electric light, fitted up by Messrs. Siemens with nine arc lamps and 170 Swan lamps. Five of the arc lights are placed in the engine room and four on the deck The current is provided by two of Siemens' alternating current machines, each driven by a separate engine.—*The Illustrated London News.*

A Government Fish Steamer.

The Government is now building in Delaware a fine new iron steamship for the special use of the Fish Commission. It is to cost $200,000, to be named the Albatross, and to be ready in about four months. Its dimensions will be: Length, 200 feet; beam, 27 feet 6 inches; depth of hold, 16 feet 9 inches; burden, 800 tons. Among the special appliances fitting the vessel for its purpose will be a deep sea dredge and eight miles of wire rope. One of the first important services of the Albatross will be the transportation to London of the collection which will represent this country in the great Fish Exposition next May.

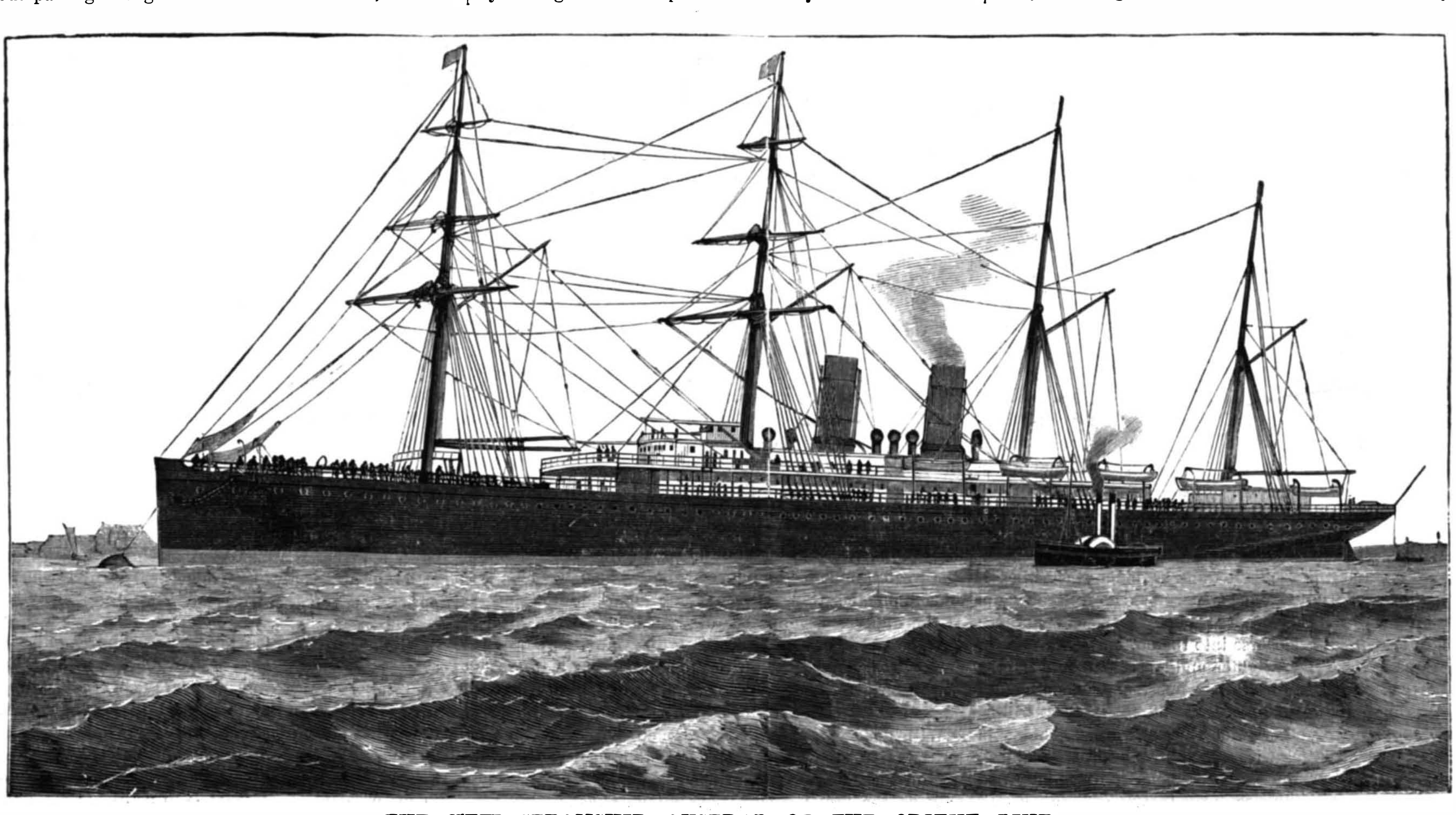


THE OPERATION OF TRANSFUSING BLOOD.

THE DIRECT TRANSFUSION OF BLOOD.

Among the various methods of transfusing blood that have been employed, the most commendable appear to be those of Dr. Oré, of Bordeaux, and Dr. Roussel, of Geneva. The process of the latter has recently occasioned a remarkable cure which has attracted much attention from the medical world, and we are therefore glad to make it known to our readers. Facts, as we know, speak for themselves, so we will give these in a succinct manner. Mrs. M., aged 31 years, had had five living children and two miscarriages. In December, 1881, after six months of gestation, she gave birth to two children—one of them was stillborn and the other lived for a few hours only. The patient in spite of all cares gradually became feeble from week to week. She was attended by her physician, Dr. Chauvin, and by Drs. Brochin and Pean. On the 31st of January she went from bad to worse; and, on the 1st of February, there was little hope for her. Anorexia, vomitings, insomnia, inertia, diarrhea, anemic hectic fever, cadaverous face, and approaching dissolution; such were her symptoms. Drs. Pean and Brochin then suggested transfusion as a last resource. This was performed by Dr. Roussel, who describes the remarkable operation as follows: On the 5th of February Dr. Brochin came to the Grand Hotel to ask my concurrence. I found the patient inert, scarcely conscious, without heat, without respiration, as pale as a corpse, veins invisible, and pulse filiform at 140.

The heart and lungs appeared to me to be healthy, and I consented to operate, February 7th, 4 o'clock P.M. The patient is in the state above described; to-day she has had diarrhea nineteen times; her pulse is filiform, tremulous, and 150. The sister and husband of the patient offer me their arms; but, after an examination, I prefer to make a choice elsewhere. There is made known to me a business man of the street who employs many strong workmen. Mr. Z. at once comprehends the importance of my request and causes his men to call, and to them I explain that it is a question of saving a mother of a family by giving her a little blood taken from the arm of one of them by a single puncture which I affirm will be harmless. Several consent. I select a young man of about thirty years of age, healthy and robust, named Adrien Renaud. We go up to the patient's room, where are present Drs. Brochin and Chauvin and the husband, sister, and other relatives. The transfuser is washed in warm water to which has been added a little soda. I uncover the breast of the patient, and stretch her arm along the edge of the bed. I seat R., and place his arm parallel with that of the patient, and surround it with a bandage so as to cause his veins to swell. After having carefully sought and noted with ink the course of the humeral artery at the bend of the elbow, I mark a point of ink at two centimeters beyond the course of the artery, on the median vein, which appears to be prominent and well swollen with blood. Resting the initial cylinder of the transfuser in such a way that it figures the circumference of this central point,



THE NEW STEAMSHIP AUSTRAL OF THE ORIENT LINE.

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I cause the annular cupping apparatus to adhere by a pressure on its bulb.

Then, turning to the patient, I find that her veins are so bloodless as to be invisible. I succeed in discovering them by placing a bandage on her arm. I raise a fold of the skin transverse to the median vein, and, cutting it with the bistoury, find that the vein is bluish and very narrow. I prick it with a fine erine, and then, removing the bandage from the arm, confide to Dr. Brochin the care of cutting a small piece from the vein with the point of a fine scissors and of introducing the canula into the narrow vessel. A few drops of very pale, thin, and incoagulable blood run out.

During this time I have dipped the bell of the aspirating tube of the instrument into a vessel of water heated to about 40 degrees. By working the bulb, this water fills the entire transfuser, heats it and expels the air that it contains. It was after all the air was expelled by the water that Dr. Brochin introduced the canula into the patient's vein.

The patient is now in such a state of inertia and anemic anæsthesia that she makes not even the slightest movement, either during the incision of the skin or during the preparation of the vein.

Our two subjects are now united by an uninterrupted channel full of water and free of air. A sharp tap on the head of the lancet opens Renaud's vein, and his blood soon makes its appearance at the orifice of the tubes, after having driven the water before it. The water section tube as well as the expulsion tube are closed, and a direct current of blood is set up. Slowly, never removing my eyes from the patient, I press the pump bulb, and force the blood easily into the vein in quantities of 10 grammes each time. At the tenth contraction of the bulb the patient breathes more deeply and quickly. When questioned she answers that she feels no discomfort, but experiences a heat rising from her arm into her breast.

Dr. Brochin easily ascertains under his finger that the blood is distending the rubber tube and the vein at each pressure; and, moreover, we all perceive the vein becoming more apparent and turgid as far as the arm pit.

At the seventeenth injection of ten grammes, perceiving a resistance in the bulb and a slight agitation in the patient, I stop transfusing, after 170 grammes of Renaud's blood have passed into the patient's veins.

The preparations for the operation were somewhat prolonged by the absolute lack of comfort and room in the apartment. It was difficult to light the latter well, and Dr. Chauvin was good enough to hold a lamp so as to light alternately each subject. The operation itself lasted five minutes.

Renaud's arm was dressed with a simple bandage, and he returned to his work very much pleased with the service that he had rendered.

February 8th.—The patient has slept, although she has awakened several times. During the day she has eaten six times. She has spoken aloud, and has not felt the least pain.

February 9th.—The patient has slept well the entire night, and for the first time in six months.

Feb. 10th and 11th.—State of convalescence assured.

February 12th and 13th.—Madame M. is sitting up, and is certainly cured. Hereafter she can dispense with my care.

Such is the interesting case that we have desired to make known. It now remains to say a few words in regard to the instrument employed by Dr. Roussel—his transfuser.

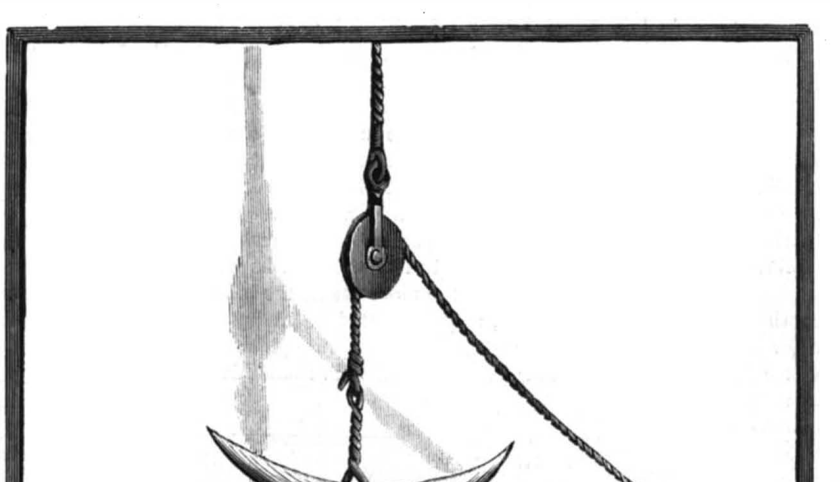
The apparatus consists of a soft, elastic, warm, and moist tube, after the style of the blood vessels, designed to be placed between the vein that yields the blood and that which receives it. This tube carries a suction and force pump, which gives impulsion to the venous blood, while measuring the quantity and velocity of the same. Two bifurcations, one at the beginning, and the other at the end of the tube, allow of the entrance and exit of a current of warm water so as to drive out the internal air and heat the instrument without the water itself being forced into the patient's circulation.—*La Nature.*

THE nitric solution of the two metals is mixed in a beaker, or a large porcelain crucible, with 4 to 5 c. c. of pure glycerine, supersaturated with ammonia, and mixed with 10 to 15 c. c. of concentrated soda-lye. The clear liquid thus obtained is heated, and boiled for three to five minutes; the formation of a silver deposit on the sides is prevented by stirring with a glass rod. When cold the reduced silver is filtered off, washed with boiling water, with warm dilute acetic acid, and again with hot water. The acetic acid in the filtrate is neutralized, and the lead thrown down with sulphureted hydrogen. The separation of silver from lead is practicable in presence of copper and bismuth, as the oxides of these metals are soluble in glyceric alkalies.—*E Donath.*

THE AMERICAN TUNNY.

BY C. F. HOLDER.

Probably no family of fishes exceeds the mackerels (*Scombrinæ*) in their economic value. Having a wide geographical range, the different genera are found in almost all the waters of the world, everywhere being a benefit to man, and from their beauty, form, and peculiar habits attracting universal attention. The family is divided into four sub-families: 1st. Scombrinæ, distinguished by the short first dorsal and the wide space between it and the second, and the pectorals high up, including the genus *Scomber*, or common mackerels. 2d. The Orcyninæ, of which the subject of our illustration is a member. Here the spinous dorsal is contiguous to the soft, the pectorals comparatively low, the caudal peduncle with a median adipose carina, or fleshy keel, and two others, one above and one below, converging backward. This sub-family includes orcynus, sarda, and cybium, and related forms. 3d. Thyrsitinæ, in which the spinous dorsal is also long and pectorals comparatively low, but the caudal peduncle is not keeled. This family includes the genera thyrsites, ruvettus, etc. 4th. Gempylinæ, distinguished from the others by the very long body (the height being less than a tenth of the length), and the numerous spines of the first dorsal, represented by the genus gempylus. Very recently an American tunny was brought into Fulton Market, and from its great size attracted general attention. It was nearly nine feet long, and weighed between 800 and 900 pounds—a magnificent fish, its entire make up denoting wonderful speed and activity in its native element, where, with their rich coloring, iridescent and silvery tints, they present a wondrous spectacle. It is rarely that they are captured so near New York city. In Rhode Island and by some of the more northern fishermen it is called the albicore, as well as American tunny, and its range is from Newfoundland to Florida. Rondelet figures a tunny under the name Thon, and another species which he calls Pelamyde, or Thon d'Aristole. The first he denominates in Greek as Orkunos, which, he says, is the "Grand Thon." The generic name now used is evidently from the old Greek designation, and tunny is from thynnos, the more common term in use among the ancients. The fish seems to have been well known along the Mediterranean Sea. Rondelet figures a bize, which he calls also sarda, and which he says is called by Pliny pelamydes. It will be seen, then, that these names, which are retained by modern naturalists, were used by the earliest writers to designate species very closely allied.



THE AMERICAN TUNNY.

Storer says: "The species known along our coast as horse mackerel and albicore comes on to Massachusetts Bay about the middle of June and remains until October. It is frequently taken for its oil, which is taken from the head and belly, a single specimen often yielding twenty gallons."

They grow to a great size, and in 1855 one was caught off Lynn, Mass., that weighed over 1,000 pounds, was 10 feet long, and 6 feet in girth. It was presented to the Lynn Natural History Society by Dr. J. B. Holder, who was then the honorary curator. In a memorandum note in the History of Lynn, Dr. Holder says: "In this year (1850) they were very abundant, small ones being seen jumping out of the water; and I have measured several that were 10 feet in length."

After this they were rarely seen, but in 1871 a number were observed, as well as great quantities of a small tunny, *Orcynus alliteratus*, which, remarkable to relate, and showing their great range, had previously only been known in the Mediterranean Sea. The common tunny of the locality is the *Thynnus vulgaris*, and is said to have been seen in our waters. It attains a much greater size than its American representative (*Orcynus secundo-dorsalis*). Specimens have been found 20 feet in length, exceeding half a ton in weight. A casual observer would hardly note a specific difference between the two, so much do they resemble one another. From a very remote period the fisheries near the Island of Sicily have been valued, and in the summer vast shoals of them are caught in large nets or by means of what the Italians call tonaro.

In appearance the thynnus bears a close resemblance to our mackerel, except in point of size. Each jaw is furnished with a row of small sharp pointed teeth, slightly curved inward; the tongue and inside of the mouth are very dark colored; the cheeks covered with long narrow pointed scales; the operculum is smooth; the dorsal and anal fins are followed by nine small finlets, and the tail is crescent-shaped. The upper part of the body is very dark blue; the belly a light gray, spotted with silvery white; the first dorsal fin, pectorals, and ventrals black; the second dorsal and anal nearly flesh-colored, with a silvery tint; the finlets, above and below, yellowish, tipped with black. This description well applies to the American tunny, though the Fulton Market specimen had lost its brilliant colors when we saw it. Mr. Garrell, quoting from Mr. Couch, says that "the tunny appears on the Cornish coast of England in summer and autumn, but is not often taken because it does not take bait, or at least the fishermen use no bait that is acceptable to it, and its size and strength seldom suffer it to become entangled in the nets. It feeds on pilchards, herrings, and perhaps most other small fishes, but the skipper (*Esox saurus*) seems to be its favorite food, and it has been seen to leap in the air after them and endeavor to cut them down after the manner of the thrasher.

According to a French writer the greatest tunny fishery of the present day is that at Provence. Here the haul is made by an inclosed net called the *madrague*. The net consists of a combination of nets, which is quickly cast into the sea to head the tunnies at the moment of their passage. When the sentinels posted for the purpose have signaled the approach of a shoal of tunnies and its direction by the indications of a flag which points to the spot occupied by the finny tribe, the fishing boats are immediately directed to the spot indicated and ranged in curved lines, forming, with the light floating net, a half circular inclosure turned toward the shore, the interior of which is called the garden. The tunnies thus inclosed in this garden between the shore and the net become crazed with terror; as they advance along the shore they press upon the inclosure, or rather a *new* interior inclosure is formed with other nets held in reserve. In this second inclosure an opening is left through which the fish have to pass. In continuing thus to diminish the space by successive inclosures each occupies a smaller diameter, in which the fish are inclosed in about a fathom and a half of water. At this moment a seine is thrown into the garden, this is in turn hauled by the men into shallow water, and the small fish taken by hand, and the larger by hooks made for the purpose and thrust into the gills. A single day of such fishing will oftentimes produce 16,000 tunnies, ranging from twenty-five pounds upward. The madrague above mentioned is a permanent fishery, and consists of a vast inclosure formed of nets into various chambers, supported by corks and held in place by weights. The net is intended to arrest the shoals of tunnies as they leave shallow water for open sea. For this purpose a long alley or run is established between the sea shore and the park or madrague. The fish follow the run, and after passing from chamber to chamber, at last find their way into the interior. To force them near the "park" trap nets are used, hauled by boats, and finally, when they are thoroughly in the toils, the net is raised to the surface, and the victims killed with

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poles and various weapons, the sport, if it can be called such, lasting the entire night.

As an eating fish it is there preferred to the salmon, and a French gourmand says of it: "For our part we put it far above salmon. Nothing is comparable to the fresh tunny thrown into a hot frying pan, and sprinkled with vinegar and salt. When properly cooked nothing can be more firm or savory. In short, nothing of the kind can rival or even be compared with the tunny as we find it at Marseilles and Cette."

The large tunnies of our coast are by no means such delicacies, though their cousins, the mackerels, when fresh and broiled—not fried—are equally up to the French ideal.

The Viscosity of Liquids, and its Relation to Chemical Constitution.

The time that it takes a liquid to flow through a capillary tube, under certain conditions, will depend on its viscosity. By comparing different liquids under exactly the same experimental conditions, the difference in tenacity, or their *specific viscosity*, can be determined from this difference in time. Richard Pribram and Al. Handl have been able to prove experimentally that there is an undeniable relation existing between the specific viscosity of homologous liquid substances and their chemical constitution, and that these can be expressed by definite rules for certain substitutions. By means of new and very carefully prepared pure substances, they have recently increased the number and value of their experiments. These have been published in two very exhaustive memoirs presented to the Vienna Academy of Science, and with them the conclusions drawn from all their observations. Omitting the special description of the apparatus employed, and the details of the separate experiments given in the original, the *Naturforscher* gives the following summary of their work.

The first question to be answered by farther experimenting was in regard to the action of isomeric esters (or compound ethers), of which Gueront had asserted that they possessed equal fluidity for equal volumes, the statement being based upon a few observations. It was not found to be strictly correct. It is true that the tenacity (or viscosity) for equal volumes of isomeric esters did not vary a great deal; but these variations ought not to be neglected, and it was found that there was a regularity within these variations which was clearly apparent if the esters were grouped together according to their composition.

If those esters were grouped together, in which the isomerism is due to simple interchange of alcohol radical for an acid radical, the table showed that in those cases where a difference could be seen with certainty, an ester containing a higher alcohol radical would possess greater viscosity, while the one containing a higher acid radical would, of course, have less tenacity, or greater fluidity. In general, these differences of specific viscosity for equal volumes increase as the molecular weight of the alcohol radical increases.

Interesting relations were further apparent in comparing isomeric ethers, in which the isomerism is due to a different arrangement of atoms in the alcohol radical or the acid radical. The compounds of this series which were examined showed that esters containing normally constituted radicals, were more viscous than those isomeric with them, and this was equally the case whether the isomerism was in the alcohol or in the acid radical.

Experiments were then made to ascertain whether similar relations to those last mentioned also existed in the other series. Among the haloid compounds of alcohol radicals, the butylic compounds acted the same in this respect as the esters. With propylic compounds, however, the difference in tenacity for equal *volumes* was very small, while for equal *quantities* the differences were larger; but in an opposite direction, the normal compounds having the smaller viscocity.

The aldehydes, like the ethers, showed greater fluidity in the normal compounds. The isomeric alcohols showed no regularity in the few examples examined, which belong here. A few nitro-derivatives of the fatty series, that can be introduced here, exhibited as little regularity.

"Now, if we take a general survey of the relation of normally constituted substances to the isomeric ones in the different groups, it will be seen that in the majority of cases the normal compounds have the greater viscocity. This rule applies to all the esters, the aldehydes, propylic alcohol (at 50° C.), nitropropane, butyric acid, and butylic iodide; on the contrary, the propylic haloids, butylic alcohol, and nitrobutane, all deviate from the rule."

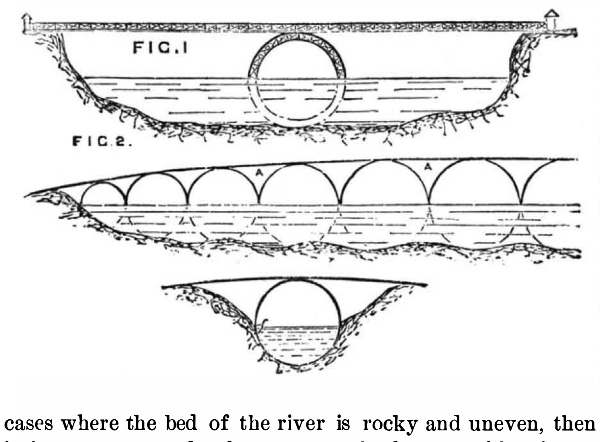
The relation which Brühl has very recently described as existing between the specific refractory power, and the presence or absence of numerous conditions of the atom in the molecule, gave them occasion for observing the specific viscocity in this direction. It was found that when an alcohol passed into an aldehyde or ketone, the fluidity increased. This is considerably greater when two hydrogen atoms go out, and there is a double bond formed between a carbon and an oxygen, than in those cases where the loss of hydrogen is compensated for by a double bond between two atoms of the same kind. This decrease of viscocity, when an alcohol goes into an aldehyde or ketone, is always the same per cent of the whole, whether calculated to volume or to quantity (weight). With increasing molecular weights, however, the absolute difference between homologous alcohols and their corresponding aldehydes or ketones is always greater.

The observations that have been made by this grouping may be embodied in the following general statement: "In homologous series, the increase of viscocity is in general proportional to the increase of molecular weight. The coefficient of increase, however, depends upon the structure of the molecule, and is constant only in those cases where the members of the homologous series, considered as binary compounds, contain one member that is fixed, and the other variable. In the series of halogen derivatives of normally constituted hydrocarbons, the form of the molecule has less influence than the weight of the molecule; with so-called isomeric compounds it is distinctly noticeable."

What was previously ascertained concerning acids was merely confirmed. An exhaustive discussion of the observations made on alcohols, and a comparison with the older results of Rellstab, lead to a surprising result, namely, that the two curves (of tenacity and molecular weight) run parallel only when the two butylic alcohols change places, the isobutylic alcohol being put in the normal series, and the normal alcohol transferred to the isomeric series of alcohols. Finally, the nitro-compounds confirm the law that the viscocity increases nearly in proportion to the increase of molecular weight.

NEW FORM OF BRIDGE SUPPORTS.

The accompanying diagram illustrates designs by Mr. J. F. Smith, Leicester, England. He proposes, says the *Engineer*, that bridges shall consist of iron or steel cylinders of any reasonable diameter, made up with plates riveted to rolled iron or steel ribs, the strength necessary to carry any weight required; they are generally of a circular section, and the lower half of the cylinder, or inverted portion of the arch, supports the upper half, and has a continuous bearing on the ground or bed of the river its whole length; the larger the cylinders the more stable the bridge. These bridges, or cylinders, may be riveted up in dry dock, a portion of the ends covered with movable plates, floated into position and sunk; the only trouble in foundations being in



cases where the bed of the river is rocky and uneven, then it is necessary to level or groove the bottom with "jumpers" from a platform over the line of intended cylinder. For small water-courses under turnpike and other roads, Mr. Smith says these bridges may be riveted up on the spot, rolled in, covered over, and the bridge is made as in Fig. 3, without any piling, diverting watercourse, building foundations and arches, or other trouble and expense usual in the old style of building bridges.

Where railroads are to be formed over frequently flooded or boggy land, a number of these cylinders laid side by side —as in Fig. 2—will, it is claimed, save railway companies the enormous cost of foundations. The cylinders having a continuous bearing the whole width of the railway cannot possibly sink very much, and the rail level would be made good on the top in case of any subsidence.

Light and Color.

BY ALFRED DANIELL, M.A., B.SC.

Light is a form of wave-motion in the all-pervading ether; and it scarcely needs, nor does space allow, a lengthened discussion of the varieties of converging proofs which aid one another in forcing us to this conclusion. If we throw a couple of stones on the surface of water, we find a couple of systems of rings produced, which at their points of crossing present the appearance of engine-turning. Where the crest of one coincides with the crest of the other, there is double upheaval; where the trough of one coincides with the trough of the other, there is double depression. Where, however, the crest of one coincides with the trough of the other, what do we find? Neutralization of effects—no effect, no motion; for the instant a state of rest. This is exactly what happens when two beams of light coming, or appearing to come from two points exceedingly near to one another, are allowed to shine upon the same spot. The phenomena of interference of light are phenomena in which light added to light produces darkness in some places, and extra brightness in others—darkness when the same spot is affected by waves which are in opposite places, and increased brilliancy when the waves are in accord with one another. This is a matter capable of easy explanation when the phenomena of light are considered as due to wave-motion; but under the old corpuscular material theory of light it was very difficult to explain, as indeed it was to understand or believe the explanation offered.

The phenomena of color are again due to waves of different lengths. Each color and shade of color, provided that it is in the spectrum, is due to a special wave-length. The waves of light which produce in our eyes the impression of deep red have a length of about the 37,640th part of an inch; and since the ripples of 192,000 miles of space break upon the eye in a second, we learn that during each second we spend in contemplating the planet Mars, or any red star, the prodigious number of 458,000,000,000,000 break upon the eye; and if the red object we look at be terrestrial, it must be in a state of continued vibration, which enables it during each second to start this enormous number of waves traveling through the ether and striking the eye. The other extreme in color is produced by certain violet rays, which have a wave-length of the 60,000th part of an inch, and of which more than 700,000,000,000,000 strike the eye during every second. But there are still more rapid vibrations, propagated by the ether, to which our eyes are not sensitive, but to which our photographic plates do respond; and there are vibrations, slower than those of the extreme red, to which our eyes are not specially sensitive, but which our skin and general bodily organisms perceive as heat rays. The slower waves are thus the cause of radiant heat, the more rapid ones cause the sensation of light, and the most rapid produce the chemical effects upon which photography depends. Yet there is no broad line of demarkation between these departments of energy-bearing waves. The red rays are felt to be warm by the hand, and seen by the eye to be red; the violent rays are seen by the eye to be violet, and are also found to be active in relation to photographic plates. What lies beyond these we do not know. There is no probable reason, in the nature of things, for such a limitation of vibrations in the ether to one or two octaves; but whether there be or be not any radiations through space which are slower or more rapid than those with which we are acquainted as heat waves, light-waves, or actinic waves, it remains that we do not know anything about them, for we have no senses which perceive them, and we have as yet discovered no instrumental means for their detection. Yet we suspect their existence. Many of the vibrations of luminous bodies are connected with one another in the same way as the harmonics of a low musical note are related; and thus we may, without any material call upon our imagination, suppose ourselves to be in relation to the vibrations of light in much the same position as we can easily suppose a grasshopper to be on listening to the boom of a church organ. The grasshopper can hear sounds which are beyond our hearing, sounds high and keen edged, sounds like those which he himself makes: but it is probable that we in our turn can hear low tones which the grasshopper cannot hear, and that on listening to a full-chorded combination of sounds, the insect would be deaf to the lower notes, and would hear simply a crowd of harmonics, which would seem at first to bear no relation to one another. In the same way, we can suppose ourselves to be blind and devoid of sensation in respect of those long fundamental waves in the ether, of which these light rays and heat rays are some of the harmonics. Too much stress must not be laid on this, however, because our knowledge (though growing) is not yet very great in this regard; and there is not much evidence that there is any material loss of recognizable or perceptible energy in the shape of unrecognizable or imperceptible radiations.

Color in the theory of light resembles pitch in the theory of sound. Both depend upon the length of wave which strikes upon the appropriate organ of sense after traveling through the appropriate medium. Yet though they depend upon the length of wave, the length of wave does not explain the sensations of color or pitch. The theory of light and that of sound are both, in the most rigid sense, sciences of calculation, of applied mathematics, mechanical sciences. They have nothing to do with the emotional effect of the harmony of colors or of sound; or with the relation between beauty of color or of sound, and the admiration which this calls forth from a sensitive mind. They have to deal with vibrations alone, and a transversal vibration in the ether, having a wave-length of the 51,110th of an inch, and falling on the retina of the eye, may or may not rouse the enthusiasm of the mind which is behind the eye that perceives the blue of heaven; but physical science, concerning itself with the vibration as such, and as such only, stops short where physiology and psychology take up the burden of discovery and of explanation.

White light, such as that which comes to us from the sun, is composed of almost all the vibrations within the limits of visibility, simultaneously traveling through space, and simultaneously striking our eyes. When a ray of bright white light strikes the eye, we have no sense of any special color in the mixture, and this is the sensation of white light; the mixed sensation of all colors, of which none preponderates, is the sensation of uncolored or white light. If an orchestra sounded forth every imaginable note within the compass of our hearing, the blinding flare would not produce in our ears the effect of any particular pitch; the result would simply be an indescribable Wagneresque ocean of pitchless sound. So it is, and as wonderful, but that we are more accustomed to it, every time we behold white light; and our object when we endeavor to procure what we call pure white light is to procure light which is due to all possible vibrations, of which no one preponderates over the other so as to impress the aggregate result with its own colored individuality.—*Journal of Gas Lighting.*

The American Association.

The annual meeting of the American Association for the Advancement of Science will take place at Montreal (not Buffalo as stated in our last), on Wednesday, Aug. 23, 1882.

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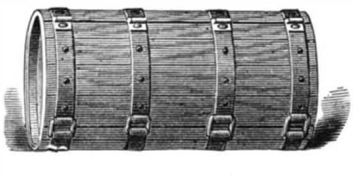
RECENT INVENTIONS.

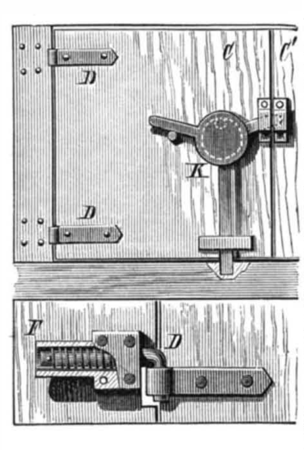
A Novel Folding Barrel.

Mr. Armistead Barksdale, of Statesville, N. C., has patented a folding barrel or hogshead for transporting tobacco or other dry substances that may be folded when not in use. The staves of the barrel are straight, and the barrel is divided into three sections, the staves being secured to metal hoops or bands by rivets. The bands are hinged together by narrow links at one of the folding joints and wide links at the other. The ends of the hoops have eyes adapted to fit together and receive a locking bolt, which fastens the sections firmly together when the barrel is set up. The heads are made in two parts, and are secured to wooden hoops by rivets, the hoops being laid edgewise against the face of the heads and flush with their outer edge. The heads are attached to the body of the barrel by thumb-bolts, which pass through the hoops and staves. To pack the barrel it is laid on its side and the heads removed. The sections of the barrel are then folded on each other, and one of the heads placed on the top and the other on the bottom, and the whole screwed together by bolts. In this form the barrel can be handled with convenience and occupies but one-tenth space of one set up.



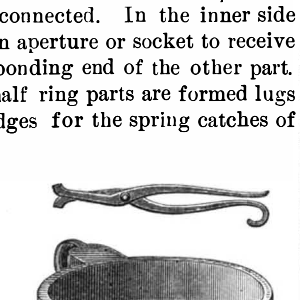
Grain Car Door.

An ingenious device by which the closing of the doors of grain cars is insured has recently been patented by Mr. Martin Graff, of Terre Haute, Ind., and is shown in the annexed engraving. To the door posts of a grain car are hinged doors, C C'. To the outer corners of the doors are attached eye straps, D, of hinges, the shanks of the hooks of which pass through holes in the inner ends of tubular sockets, F, that are inserted in recesses in the inner sides of the door posts, where they are secured. Upon the shanks of the hooks within the sockets, F, are spiral springs, the forward ends of which rest against the end of the sockets, and at their rear ends rest pins attached to the ends of the shanks of the hooks. When the doors are unfastened the pressure of the grain causes them to swing out, and the outward movement compresses the springs. When the doors are released from outward pressure the tension of the springs closes them. A handled eccentric provided with bolts is attached to the door, by which it is locked and held to its place.



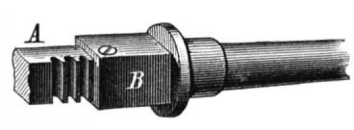
An Improved Shackle.

Mr. James M. Trackwell, of Skookumchuck, W. Ter., has lately patented a useful improvement in shackles, by which they are made more convenient for applying and removing, and are more secure for use than those ordinarily constructed. The improved shackle is shown in the annexed cut. The body of the shackle is made in two half ring parts, and upon the end of one of these parts is formed a projection having an eye at its outer end to receive a chain when two shackles are to be connected. In the inner side of the projection is formed an aperture or socket to receive a lug formed upon the corresponding end of the other part. Upon the other ends of the half ring parts are formed lugs which have notches in their edges for the spring catches of the lock to engage with. In the edges of the ends are dovetailed recesses to receive the corresponding projecting ends of the top and bottom of the lock, J, which has in its inside recess spring catches that engage with the notches on the ends of the half parts. The key of the lock is made in two pieces, that are pivoted to each other at a little distance from their forward ends. The forward parts of the key are made thin, and have square hooks formed upon them which project in opposite directions. When these blades of the key are brought into position parallel with each other, they are passed into a narrow key hole in the outer end of the lock, and by pressing the handles the hooks at the ends are projected, so as to press the spring catches outward and release the lugs on the shackle, and then by pulling the key outward the lock is withdrawn from the lugs, allowing the shackle to be separated.



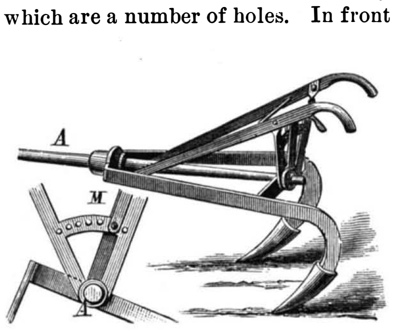
A New Vehicle Axle.

A device for preventing wagon wheels from moving in and out on their axle spindles is shown in the annexed engraving. A is a square axle prolonged into a round spindle, and across one of its faces, a little in the rear of its shoulder, are formed several parallel grooves. B is a collar provided with a square sleeve that fits on the axle, A, and the collar extends over on the spindle, so as to come against the hub of a wheel on this spindle. When the collar and sleeve are moved out against the wheel it is held in place by a bolt passed through holes near its edge and through one of the grooves in the side of the axle. There being a number of grooves the collar may be adjusted to suit any wheel. This device is patented by Messrs. Alfred Deisher and William H. Adam, of Fleetwood, Pa.



An Improved Cultivator.

An improved cultivator, in which devices are provided for guiding and controlling the plows when using them on side hills, is shown in the accompanying engraving. To the middle part of the drawbar, A, is attached the forward end of the plow handles, the rear ends being connected and held by a round, and they are supported by braces attached to the rear end of the drawbar. The braces are connected by an arched bar, M, in which are a number of holes. In front of the handles upon the drawbar is placed a loose collar, to the opposite sides of which are attached the forward ends of plow beams that at their rear parts are curved downward and have shovels attached to their ends. The beams are connected by a cross bar which has a hole through its center to receive the rear end of the drawbar. To the center of the cross bar is attached an upwardly projecting bar that serves as a handle for adjusting the plows. This bar is held in any desired position by a spring catch pin that works in the holes of the arched bar of the handles, and can be swung to either side to bring the plows into such position that the handles shall be upright while the plows are working upon the side of a hill. This device is patented by Mr. Walter B. Cullum, of Benwood, W. Va.



Death Not Universal.

Whatever lives, we hear it said, whether plant or animal, must sooner or later die. It will, therefore, greatly shock many persons to learn that this is not strictly the case. We wish here to give room for no misunderstanding, and, if possible, for no intentional misinterpretation. All animals *may* die, but death is not in all departments of animal kingdom an inherent absolute necessity. On the contrary, in one of the two primary divisions of the animal world, the Protozoa, it is, though common enough, merely casual, the result of some accident. A Protozoon may be swallowed up by some larger animal; it may be crushed out of existence, burnt, or poisoned by "disinfectants" introduced into the water or other fluid which it inhabits. But it has no natural term of life, and, as we shall presently see, cannot be spoken of as young or old.

That this may be understood we must briefly compare the life history, and especially the reproduction, of the *Metazoa* and the *Protozoa*. In the former group—which includes all the backboned animals from man down to the humblest fish, all the insects, mollusks, as well as lower forms of life which scarcely attract popular notice—there is always a distinct difference between parent and offspring. The latter is certainly a portion separated from the body of the parent—from the female in all those forms in which there exist two sexes—but it is as compared with the parent minute in size, rudimentary in structure, and it has to increase in bulk, and still more to undergo a process of development, a series of transformations, before it reaches the normal stature and make of its species. When this point has been attained it enters upon the task of reproduction, and gives birth to one brood of young ones, or in the higher forms to several. With these it coexists for a longer or shorter time, and then dies, the matter which constituted its body passing into decomposition. If we look at these very familiar facts in the life of a Metazoon, be it a man or an oyster, we find that the ideas of birth, of growth, of maturity, of parenthood, of a natural term of life ending in death, at once suggest themselves. If we examine such a Metazoon we can, in most cases, at once decide whether it is in the immature or the adult phase of its being.

But in the *Protozoa*—as Herr Bütschli has not long ago pointed out in the *Zoologischer Anzeiger*—this is distinctly different.

Let us suppose we are watching through a microscope one of these minute single cell creatures. We see it expanding into an ellipsoidal figure, which becomes for a time longer and longer. It then begins to contract about what we may, for the sake of popular intelligibility, call its equator. It assumes the form of two nearly globular bodies, connected, dumb bell like, by a narrow neck. This neck becomes narrower and narrower, and at last the two globes are set free, and appear as two individuals in place of one! What are the relations of these two new beings to the antecedent form and to each other? We examine them with care; they are equal in size, alike in complexity, or rather simplicity, of structure. We cannot say that either of them is more mature or more rudimentary than the other. We can find in their separation from each other no analogy to the separation of the young animal or the egg from its mother, or to the liberation of a seed from a plant. Neither of them is parent, and neither offspring. Neither of them is older or younger than the other.

Or shall we try to regard them as brothers sprung from the same parent? If so, where is that parent? If living, let it be shown; if dead, where are its remains? No organic—or indeed any other—matter was separated out when the two new beings took their rise. All the substance of the body of the original Protozoon is included, and equally included, in the bodies of the two individuals before us. Thus we see that the essential ideas of the life of the higher animals—birth, growth, maturity, parentage, brotherhood, term of life, and successive generations—have, if applied to these humble and minute beings, simply no meaning.

The process of reproduction, or rather of multiplication, must, as far as we can see, be repeated in the same manner for ever. Accidents excepted, they are immortal; and frequent as such accidents must be, the individuals whom they strike might, or rather would, like the rest of their community, have gone on living and splitting themselves up forever. It is strange when examining certain infusoria under the microscope, to consider that these frail and tiny beings were living, not potentially in their ancestors, but really in their own persons, perhaps in the Laurentian epoch!

This consideration opens up another question. These beings are not wholly unconscious. They experience and retain impressions, however dimly and in however limited a sphere. But when the splitting up of one individual into two distinct personalities takes place, as we have described above, we have then the curious phenomenon of two distinct and equal beings whose past life is one, who will remember the same incidents and the same reactions to which such incidents have given rise. Here again is a phenomenon which we cannot realize—two contemporary and coequal beings possessing, up to a certain point at least, a common psychical life. Let us for a moment suppose that the propagation of the higher animals took place in a similar manner. We should see, *e. g.*, the mature man split up into two equal and similar men, each remembering, knowing, believing, and feeling up to the day of fission, all that the other remembered, knew, believed, or felt; each, too, it might be contended by moralists, equally sharing the merits or demerits of the antecedent form, and each at a loss to say when his own personality took its rise.—*Journal of Science.*

Converting Oleic Acid into a Solid Fatty Acid.

Muller-Jacobs, of Moscow, has invented a method of utilizing oleic acid for candle making, etc. The oleic acid, or any of its natural glycerides, like cotton seed oil, rape oil, poor quality olive oil, sunflower oil, and cod-liver oil are cooled to 43° Fah., or lower, and then slowly mixed with 30 or 40 per cent of strong sulphuric acid (spec. grav. 1·823 or 1·826) which has also been cooled to the same temperature. The mixture becomes heated, and when it has reached a temperature of 95° Fah., it is mixed with twice its volume of water and let stand twenty-four hours. A sulpho-acid is formed, from which the solution of glycerine and sulphuric acid is drawn off. It is then boiled some time with water until it splits up into sulphuric acid, and a mixture of fatty acids soluble in alcohol. One of these is oxyoleic acid; the other, the author tells us, is a solid fatty acid but does not state positively whether it is stearic acid, or not. He says that on cooling the alcoholic solution the solid acid crystallizes, and the liquid one can be expressed. The former can be purified by washing it with alcohol (rather costly!) or benzine or by distillation. It melts at 70·6° C. (159° Fah.), resembles stearic acid, and can be used for candles. The liquid portion is oxyoleic acid, and can be saponified with alkali and used as a mordant for Turkey red. It can also be utilized for making soap.

If the saponification with acid does not take place at a low temperature, or the sulphuric acid is too strong, a large quantity of sulphurous acid is evolved, and decomposition products of the fatty acids are formed that are of no use either for candles or for dyeing Turkey red. If a less quantity of sulphuric acid is employed than that above stated, only a part of the acid is decomposed in this way. The mixed acids do not form a perfectly clear solution in alcohol, and the solution will contain not only small quantities of the solid and liquid acids, but also the unchanged oil. In this case the separation of the oils and acids is so difficult that it does not pay to attempt it.

Water from Wood.

By thrusting the ends of green scrub wood—"mallec scrub"—in the fire, and catching the sap driven out at the other end in a bark trough, an Australian supplied himself with water and saved his life while crossing in a waterless region. He says that a dozen mallec sticks, four feet long and two or three inches in diameter, would give a pint of water in an hour, and suggests that the same device may possibly be found of vital importance to other bush rangers and travelers in arid regions.

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ENGINEERING INVENTIONS.

Devices for supplying railway cars with fresh air of an agreeable temperature and free from dust have been patented by Messrs. Lewis B. White, and Leonard Henderson, of Middleburg, N. C. Two pipes from a fan blower placed on the front of the locomotive lead to and connect with the several cars of the trains by means of flexible joints. One pipe passes through the boiler and fire box, conveying heated air, and the other passes outside the boiler, conveying cool air. Either may be made used separately or both together. They are connected beneath the tender, and enter the car as one tube. The fan is operated while the train is in motion by a chain from an axle of the locomotive, and when the train is at rest by a small engine supplied from the boiler. The admission of air to any car may be regulated from within the car by suitable registers, that have openings corresponding with openings in the air tubes.

Mr. Robert M. Adam, of Charleston, S. C., has patented an attachment for dredging pumps, to prevent their injury by large pieces of stone that are raised. The suction tube of the pump has a grating so arranged that the water passed through the pump must go through the grating. At the grating the tube has two opposite side branches that lead into large arms, each branch having a valve that closes the end next to the drums. A grated basket is placed in each of the drums, and a switch plate placed at the junction of the two branches provides for directing the current to either of the drums. When the pumps are operated the grating at the angle allows all pieces that will not injure the pump to pass through, while the large pieces are diverted by the switch plate into one or the other of the drums, which, when filled, are emptied.

Mr. Gideon Woodring, of Dubois, Pa., has patented an improved car coupling. The draw head of the car has a slot extending crosswise through its vertical sides for inserting from either side of the car a link, composed of two links at right angles to each other, having a hole for the passage of the coupling pin near its angle. The coupling pin passes also through elongated slots in the top and bottom faces of the draw-head. By this construction either arm may be employed as a handle to introduce the double link into the draw-head, and it may be introduced from either side of the car without danger of injury to a person.

A portable railway that is light, strong, and durable, and can be easily and rapidly built or removed, has been patented by Mr. George W. Thomas, of Fuselier Home Place, La. The railway is formed of portable track sections, the ends of the rails in one section being beveled to fit against the beveled ends of the next section, and the rails are provided at one end with cleats to receive the ends of the other rails. A turntable that fits on and between the rails carries a revolving frame that is provided with two rail pieces, beveled at one end and having staples at the other, into which hooks at the end of a rail section are hooked, so that a car can be run upon the turntable. The turntable is provided with small wheels so that it may be rolled on the track from place to place.

MECHANICAL INVENTIONS.

Improvements in windmills, by which the speed and power are regulated according to the work to be done, has been patented by Mr. Santford P. Coan, of Medicine Lodge, Kan. On the top of the frame is a platform, and to and above the platform is secured an annular head plate, upon which is fitted a turntable that supports the shaft and vane of the windwheel. The wheel is composed of a hub, spokes, an outer and inner rim, and sails, all so arranged and constructed that the sails may be turned more or less to catch the wind, by means of a governor, by this means regulating the speed. By means of a rod and suitable connecting devices, the sails may be turned and controlled from the ground.

A machine for sinking a heavy bucket through quicksand, and raising it rapidly to the surface, has been patented by Mr. Oscar Rust, of St. Joseph, Mo. The driving shaft of the machine is located at the base of the drilling frame, on a level with the fulcrum of the drill operating lever. The winding drum of the slush bucket is located nearly above the driving shaft, and is geared to it by means of sprocket wheels and a chain, while the drum for the drill rope is placed at the end of the frame opposite the driving shaft, and is geared to the winding drum of the slush bucket. This drum is placed loosely and slides upon a feather upon its shaft, and has a shifting lever, and suitable clutches to transmit power from the driving shaft to the drum of the drill rope. The full power of the machine can thus be applied to lift and drop the bucket to cause it to penetrate the sand.

An improvement in centrifugal fan blowers has been patented by Mr Robert H. Thurston, of Hoboken, N. J. The chamber of the blower is made of so much greater diameter than the wheel that a space is left around the periphery of the wheel, in which the velocity of the current decreases from the inner to the outer periphery, and outside of this space is a spiral delivery channel gradually enlarging from its point of beginning to the delivery pipes. The inner edge of the vanes of the blower are nearly perpendicular to a radius of the wheel, and they curve toward the periphery of the case, so that their outer edges are radial to the axis. By this construction the direction of the motion of the air is gradually changed until it leaves the vane radially.

AGRICULTURAL INVENTIONS.

A combined hay rack and wagon box has recently been patented by Mr. John Shafer, of Logansport, Ind. The side boards of the wagon box are made with a horizontal row of mortises near their lower edges that receive the cross bars of the rack. Hooks secured to the sideboards project slightly below them and carry the cross bars upon which the bottom boards of the box rest. These boards are taper, and the center piece is forced in to tighten them. This construction allows the bottom to be removed for unloading the box. Near the upper edges of the sideboards is also a horizontal row of mortises, for the insertion of the tenons of braces to which slats are secured that form the hay rack. The tenons of the end braces are longer than the others and pass into recesses in the end gates of the box and are held by suitable rods. The intermediate braces are held to their place by a pin which passes through holes near the ends of the cross bars.

An improved stalk cutter and crusher, by which the stalks are better prepared for feeding than by the ordinary devices, has been patented by Messrs. William H. H. Lynn and George W. Eyler, of Staunton, Va. The feed box is of the ordinary construction and the feed rollers are of conical shape, and fluted on their surfaces, the larger end of one lying opposite the smaller end of the other. The cutters are straight knives secured to the face of a revolving circular head, the face of the head being arranged to revolve at right angles to the end of the feed box. Between the end of the feed box and the cutter head is a ledger plate, and the arrangement of this plate and the cutting blades is such that a sliding cut is imparted to the cutters. On the rear face of the cutter head are crushing teeth arranged in an irregular manner, and at the rear of the cutter is a stationary crushing plate, the lower half of which has crushing teeth the same as on the cutter. As the stalks are cut they drop between the head and plate and are crushed.

Improvements in wheat drills, by which they are adapted to work on uneven or weedy ground, has been recently patented by Mr. Abram L. Ruse, of Chase, Kan. The wheels, axle, grain box, and seed-dropping devices are of the usual construction. Attached to the draw-bars of the drill are the draw-beams of circular colters that work in front of the drill hoes for cutting any weeds or sods that would prevent the working of the hoes. Upon the frame of the drill, in front of the grain box, is placed a shaft to which are attached connecting devices by which the drill hoes and colters may be adjusted to work on uneven ground and at any desired depth.

MISCELLANEOUS INVENTIONS.

A novel bottle wrapper has been patented by Mr. Henry Bell, of Baltimore, Md. The wrapper is constructed of stalks or leaves, that are a little longer than twice the length of the bottle to be covered. These are placed across each other at the center and secured together by two circular pieces of pasteboard, placed on opposite sides of the covering material, and fastened to it. The ends of the stalks or flags are then bent upward to form a hollow envelope for a bottle. For securing the wrapper around the bottle a suitable number of the flags are cut about one half longer than the rest, and a small band is passed over the ends of the flags to bind them to the neck of the bottle, and the longer ends are bent back toward the bottom of the bottle, and another band larger than the first is passed over the entire wrapper.

Some improvements in washing machines have been recently patented by Mr. Kittil Anunsen, of Winchester, Wis. The machine consists of two boards, provided on their inner surfaces with headed pins, placed in a suds box, that are reciprocated alternately by means of rotating shafts that carry mutilated cog wheels and pinions, the pinions having a complete revolution with each revolution of the mutilated cog wheel. The arrangement of the cog wheels and pinions is such that the point of rest of the boards will be at the completion of their backward movements, and the boards will be reciprocated alternately. The action of these devices is very effective in removing the dirt from the clothes.

The object of the improvement for which a patent has been granted to Mr. David B. Murdoch, of Pittsburg, Pa., is to provide fireplaces, from which all escape of dust into the room will be prevented. The fireplace has the ordinary fuel grate, and below it and connected by a passage is the ash pit, and a flue leads from the passage up into the chimney. A metal plate forms the back of the space under the grate, and in the plate are two openings which pass through the back of the grate into the flue from the ash pit, collecting and carrying away the dust into the chimney, effectually preventing its escape into the room.

A device for moistening postage stamps, envelopes, labels, etc., has been patented by Mr. Francis V. Davis, of Worcester, Mass. The moistener has an elevated chamber or reservoir, and a horizontal chamber communicating with it through a small orifice. In an opening in the horizontal chamber is placed a pad of belted wool, thick enough to stand above the upper part of the opening, when in place for use. The pad is first moistened, after which the water in the reservoir keeps it moist.

Mr. Charles Friedeborn, of Clare, Mich., has patented an improved churn dasher. A cone of sheet metal has at its apex a socket for holding the dasher handle. This cone is perforated with large holes and a radial series of smaller holes, over all of which is secured a spoon-shaped sheet metal deflector. This dasher is admirably adapted for its work, and can be easily and thoroughly cleansed.

A guide for use in sewing harness by machines has been patented by Mr. William C. Duffey, of Calhoun, Ga. The body of the guide is a metal plate bent down at the end and is attached to the machine by screws. Slides carrying guide rollers are held in slots in the metal plate by clamping screws. Between the guide roller slots the metal plate is arched, and a screw inserted in the arch carries a pressure roller, the body of the plate serving as a spring to press the roller upon the material. Channeling knives are attached, one above and the other below the plate, by a screw, and are held by adjusting screws to cut any desired distance apart, and to be in exact line with the needle.

Mr. John W. McArdell, of Brooklyn, N. Y., has patented a guard for plumber's shave hooks, by which their edges are protected while being carried. The knife and shank are of the usual construction, and are detachably secured to the handle by a pin which passes through the handle and shank. A centrally apertured disk is made a little larger than the shave hook, and to its center is attached a split tubular stem that receives the shank of the shave hook. This stem has a thread upon its outer surface to receive a hand nut by which the stem is clamped to and loosened from the shank. When the disk is pressed down the hook cannot come in contact with anything to be dulled. The disk is also used as a gauge to place at end of the pipe, so that the shaving will begin on all sides of the pipe at the same distance from its end.

An automatic regulator for windmills has been patented by Messrs. John Lamont and Hugh White, of Annawan, Ill. The water receiving tank rests on a horizontal frame near the ground, and to this frame are attached vertical ways for carrying a frame which contains a bucket that is balanced by a weight of such gravity that when the bucket is empty the frame will rise. The overflow spout of the tank discharges into the bucket, and to the bucket is attached a rod connected with the controlling mechanism of the windmill, and so arranged that when the bucket is filled the pumping ceases. As the water lowers in the tank a float operates a lever to tilt the bucket, when the pumping proceeds again.

Mr. Edward D. Blackwell, of Montpelier, V., has recently patented an improvement in writing pens, the object of which is to prevent the ink from the pen from soiling the fingers of the user. The pen, which may be of any desired pattern, has the hollow or inner concave side of its body divided by a cross wall or partition at a suitable point in the length of the body to prevent interference with the fit of the pen in a suitable holder, and to avoid impairing the elasticity or flexibility of the pen. This wall acts as a stop or dam to the ink contained within the pen from soiling the writer's or user's fingers.

A spoon that may be used by invalids and children without spilling its contents has been patented by Amelia C. Feldsberg, of Newark, N J. A spoon of ordinary form has attached to or formed upon the edge of the larger portion of its bowl a lip that is inclined toward the tip of the bowl and is highest opposite the handle and tapered each way toward the end of the spoon. The lip may be made outwardly similar in form to a section of an inverted spoon bowl. This spoon will prove of great convenience for those who have the care of children or persons that are sick.

A novel device for catching the drip of wet closed umbrellas has been patented by Mr. Charles L. L. Emery, of Biddeford, Me. The device consists of a rubber cup adapted to hold a sponge and to receive the lower end of the umbrella staff. The end of the staff passes through the mouth of the cup, a washer placed over the sponge, and a hole in the bottom of the cup. The sponge wipes the end of the staff dry and absorbs the water which runs from the closed umbrella, and the washer prevents the sponge from coming in contact with the cloth of the umbrella.

An improved writing tablet has been patented by Mr. Edwin P. Wentworth, of Cape Elizabeth, Me. The base upon which the paper is held has two notches in its edges for the reception of a rubber band, and a strip of wood is hinged to the base by a flexible flap. This strip is formed with a longitudinal groove having notches at each end for the reception of the elastic band, and by the strip the paper placed on the tablet is held to its place. If a cover is provided it is hinged to the opposite end of the base from the pressing strip, and is provided on its inner surface with a blotter, or it may be provided with a pocket for carrying paper and blotters.

A protector for the teeth of folding combs has been patented by Mr John Lowe, of Clinton, Mass. Two combs are pivoted to each other by means of a pintle in such a manner as to swing in parallel planes. Between the two combs and on the pintle is pivoted a plate provided at its longitudinal edges with flanges projecting from opposite sides of the plate, and are bent downward toward its opposite edges to form pockets for receiving the ends of the teeth of the combs to protect them from being broken.

Messrs. William F. Dodge, of Wilkesbarre, and Thomas M. Righter, of Sandy Run, Pa., have patented a novel form of meshes for coal screens, such as are used with coal breakers for sizing coal, by which the slipping of the wires and consequent irregularity is prevented. The frame of the screen is of any suitable size, and the wires are continuous between two opposite sides of the frame, and are bent so that each wire is formed with a series of angular loops. The wires are put together to form the netting by engagement of the loops forming interspaces of uniform size. The wires being connected to the frame there can be no slipping at the joints, and the screen will remain of uniform mesh under all ordinary treatment.

Mr. Charles A. Tarragon, of The Dalles, Oregon, has recently patented a portable corral that is made of separate panels, held together and prevented from lateral and longitudinal movement by suitable pins and latches. It may be taken down and packed completely for moving long distances, and is provided with wheels so that it may be readily drawn short distances from place to place without being taken down. These corrals may be of any size. At one end is a door for the admission of stock, and at the opposite end is a cabin for the herder. By a system of adjustable rafters and braces a roof frame is provided that may be covered with canvas if desired.

A device by which beginners in learning to write may easily acquire the habit of holding the hand and penholder in the proper position has been patented by Mr. Samuel S. Rogers, of Columbia, W. T. The device consists in providing the penholder with a guiding wire, to be used in combination with a hand grasp, that is formed with guides for the holder and wire. The hand grasp is formed in such shape that it prevents the third and fourth fingers from closing upon the palm of the hand, and the hand from taking an unnatural and cramped position.

Mr. Frank G. Pettus, of Mason, Tenn., has patented an improved car coupling, consisting in a drawhead having two longitudinal recesses, one of which is provided with a transverse partition, and a hook is pivoted in the other and is adapted to catch on the transverse portion in the recess of the opposite drawhead. The hooks can be raised by means of a series of pivoted rods reaching to the roof of the cars, or by cords or equivalents reaching to the sides of the car. By means of this invention the cars are coupled together firmly, and can be uncoupled and coupled rapidly and without danger. A car with an ordinary link receiving drawhead can be coupled to a car provided with this improved car coupling, as the link can be passed into the recess in the drawhead and held by the pin.

A novel and ingenious lubricator for use on shaft hangers has been patented by Mr. John M. Williams, of Pittsburg, Pa. The lubricator is composed of two goblet shaped vessels, each having hollow necks, the smaller being screwed into the neck of the larger. The external thread of the inner vessel and the internal thread of the outer are grooved vertically, the grooves in each corresponding with the other. A coiled spring is placed in the inner vessel, the lower end extending through the neck to the journal, the upper end resting against a cap which fits the top of both the vessels. Notches at the tops of the inner and outer goblets correspond with the grooves at their necks. The grooves in the neck being open, and the outer vessel being supplied with oil and the inner with tallow, the device is ready for use. As the shaft revolves, the end of the spring resting upon it becomes heated and melts the tallow, which flows to the shaft. If it is desired the oil supply may be cut off by disengaging the spring and turning the inside cup so that the grooves in the necks do not correspond.

Mr. Daniel Neilly, of Bradford, Can., has patented devices by which the pressure bar of sewing machines can be moved, and the thread slackened by the same hand that stops or starts the machine. The machine has pivoted to one side of its arm a bar, an arm on one end of which takes under a projection on the pressure bar rod, and its other end is bent to form a handle next to the balance wheel. A weight attached to the arm releases the pressure rod. One end of a slotted slide is attached to a thread slackener, and the other end near the balance wheel is bent up to form a finger piece. This arrangement brings the balance wheel and the devices for slackening the thread, and raising the pressure bar, where they can be operated by one hand. A simple and effective tension device is also provided.

Mr. Daniel Leary, of New York city, has patented a new shade holder for candles. It is made of two detachable parts, one of which fits upon the candle, the other holding the shade. The part that fits upon the candle is composed of two rings connected by rods, the upper ring being reduced in diameter at its upper end by a flange resting upon the top of the candle and supporting the whole device. The shade holding part consists of a ring that fits over the ring on the candle, and is supported from it by upward projecting rods, and a larger flaring ring which supports the shade.

Mr. Charles Connor, of New York city, has patented a rubber composition adapted to stand a high degree of heat without change. The composition consists of rubber, soda, lime, camphor, sulphur, etc., combined in proper proportions. The ingredients are thoroughly mixed and rolled into sheets of suitable thickness to suit the purpose for which it is to be used, and then put into an oven and heated to a temperature of about 290° Fah. The inventor says this compound will stand a high degree of heat, without material change, and will be very elastic, and is fireproof.

A device for securing satchels and valises to car seats, so that they cannot be stolen, has been patented by Mr. Robert Harris, of Peekskill, N. Y. The handle of the satchel is attached at its ends to staples secured to the bag frame. At one end the handle is attached by an eye in the usual manner, and at the other end it is fitted with a lock, having a hasp that passes through the staple of the bag frame. This lock has a cylindrical case to resemble the metal tip at the other end of the handle.

An improvement in sample cases for the use of travelers has been patented by Messrs. William B Worger and Edwin M. Richford, of London, England. The body of the trunk is of rectangular form, and is provided with drawers. In the bottom of the trunk is a recess, and in the ends of the recess are grooves that extend its whole depth, the front ends of the grooves being turned down at right angles to their length. The front of the trunk is a door, and upon its lower edge are secured pivots, that when the door is closed, drop into the right angled grooves and are retained there by the lid being received under the edge of the top, where it is locked. When unlocked it is free to turn on its pivots, which are then moved into the straight part of the grooves, and the door is then slid into the recess under and out of the way of the drawers.

A lamp bracket that is safe, convenient, and maintains the lamp upright in various positions of the bracket, has been patented by Mr. Morton L. Munson, of Charlotte, Mich. The bed piece of the bracket is so constructed that it may be attached to a desk or other convenient place. On the face of the bed piece is a semicircular slotted piece, and pivoted at the center of the semicircle is an arm on which the lamp is carried. This arm has secured to it a bolt which passes through the slot, and has a nut on the opposite side by which the lamp may be secured in any desired position.

TEXTILE INVENTION.

An invention by which an equal and regular supply of wool may be delivered to a carding machine has recently been patented by Mr. Ernst Gessner, of Aue, Saxony, Germany. The wool box is straight on the front side, and has within it a vertical endless lifting apron, having teeth, which, as the apron revolves, carry the wool to a revolving beater, by which the larger bunches are driven back, and the remainder is delivered to the distributing cylinder. Between the apron and the feed rollers is a grated burr box, and immediately over the grating a beater revolves, and between this and the grating the wool is dashed, the beater dislodging all particles of foreign matter, which fall into the burr box below. After the wool passes the grating it is delivered to the lap roller and wound in an even and uniform lap. Underneath the lap roll is a toothed roller, by which the wool is pulled off from the lap roll in even quantities, and it is deposited by a revolving brush upon the feed belt of the carding machine.

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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.

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Peck's Patent Drop Press. See adv., page 77.

For best Portable Forges and Blacksmiths' Hand Blowers, address Buffalo Forge Co., Buffalo, N. Y.

Paragon School Desk Extension Slides. See adv. p. 78.

Drop Forgings. Billings & Spencer Co. See adv., p. 77.

Brass & Copper in sheets, wire & blanks. See ad. p. 76.

Cope & Maxwell M'f'g Co.'s Pump adv., page 77.

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Two or three first-class journeymen machine pattern makers can find steady employment with Poole & Hunt, Baltimore, Md. Location pleasant and healthful.

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Lightning Screw Plates, Labor-saving Tools. p. 62.

See New American File Co.'s Advertisement, p. 46.

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Wood-Working Machinery of Improved Design and Workmanship. Cordesman, Egan & Co., Cincinnati, O.

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NEW BOOKS AND PUBLICATIONS.

BULLETI MENSUAL DE LA ASSOCIACIO D'EXCURSIONS CATALANA. Any V. Nos. 40 y 41. Barcelona.

This is a monthly journal published by an association in Catalonia having for its object researches, through field excursions, into the natural history and archæology of that portion of Spain. The number before us contains considerable interesting matter in regard to the antiquities of Catalonia, and is illustrated with very well executed engravings.

CELEBRATED AMERICAN CAVERNS. ESPECIALLY MAMMOTH, WYANDOT, AND LURAY; WITH BRIEF NOTICES OF CAVES AND GROTTOES IN OTHER LANDS. By Horace C. Hovey. Cincinnati: Robert Clarke & Co. 8vo, pp. 228. $2.00.

The author of this monograph is widely known as a successful explorer of underground America, having already published numerous articles in the SCIENTIFIC AMERICAN, *Scribner's Magazine*, and other periodicals, besides papers read before the American Association for the Advancement of Science. Here, however, Mr Hovey presents a large amount of new material, gathered in recent explorations, and carefully compared with more early accounts. The volume opens with chapters on the structure, varieties, and contents of caves; followed by a condensed account of cave dwellings, temples, and tombs. The "bone caves" of this and other countries supply some of the chief sources of information concerning prehistoric man, and these are treated of by the author in a manner showing his familiarity with archæological investigations. While the work is evidently not intended as a guide book, it will be found to answer for that purpose admirably, so far as Mammoth, Wyandot, and Luray caves are concerned. Among other caves described are Weyer's, Howe's, Pickett's, the Canadian caverns, the cave of Cacahuamilpa; and, indeed, we do not know of a single cavern of note that is not mentioned in these pages. The book contains more than forty engravings, besides maps and diagrams from recent surveys. An appendix gives a complete list of subterranean fauna, including an account of the famous eyeless fish, and other singular forms of life.

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 this 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) C. E. A. asks: 1. What can I use to polish brass, such as the brass on a locomotive, that will give a fine polish without much rubbing and will not easily tarnish? A. If you are constantly cleaning the brasswork of your locomotive, use ordinary whiting or chalk and a cotton or woolen cloth, with a little moisture by breathing, or from another cloth a little wet. If the work becomes stained or slightly oxidized by several days' running, then use rottenstone and oil on a cloth until the surface is clean, and finish with whiting for gloss. If parts become corroded and blackened, use a little oxalic acid in water with the rotten stone instead of oil. 2. Also something that I can use to polish paint work with? A. After cleaning your painted work you can brighten it by rubbing with a cloth moistened slightly with equal parts turpentine and boiled linseed oil. 3. Why does the water in a water-glass rise when the steam is shut out of the top? Does the steam condense in the top of glass? A. The steam condenses in the top of the glass and draws the water to fill its place.

(2) E. C. R. asks: Please be kind enough to inform me what kind of transparent coating to use on bright steel wire, to prevent rust and not destroy the brilliancy? A. Try the following: Dissolve half an ounce of camphor in two ounces of wine spirit and mix this with two pints of fine sperm oil. Allow the wire to remain in contact with this mixture, heated to 180° Fah., for half an hour, then rub off excess with a soft cotton cloth.

(3) D. M. writes: To settle a dispute will you please inform us in your columns, whether the laws of the State of New York prevent a proprietor acting as his own engineer, he being capable? A. A proprietor can act as his own engineer, but he must pass examination and take out a license same as any other engineer.

(4) E. E. M. says: In an April number of your paper appeared an article appertaining to the comet, and stating what a wonderful sight it would make in the northern heavens in the months of May and June. Now what I want to know is why it has not appeared as predicted. A. "Comet *a* 1882," discovered on the 18th of March, by Mr. Wells, of the Albany Observatory, certainly failed to carry out the expectations that were raised concerning it. It was, however, a well behaved comet in all points excepting in reaching the size predicted. It followed closely in the path predicted for it by astronomers, reached perihelion on June 10, the appointed time, and it is highly probable that we shall soon hear tidings of its reappearance as it recedes from the sun. It was frequently seen in May by naked eye observers, was an easy object in the telescope, where it was followed till it reached perihelion, even in full daylight, when in near vicinity to the sun. Its tail did not reach the dimensions anticipated, much to the sorrow of astronomers. But nothing is more uncertain than the movements of comets, and "Comet *a*" is not the first one that has disappointed human calculation. Where comets are concerned we can only predict probabilities, never certainties.

(5) J. M. asks: Please inform me how to color straw with aniline dyes? I have tried, but the dye comes off. A. Steep the straw for several hours in hot water containing about half an ounce of tannin to the gallon, then pass it through hot water containing about an ounce of white glue to the gallon and dry in the air slowly, then dye, using weak baths. Straw may also be colored by passing it through a bath of any thin pale spirit varnish holding the desired color in solution.

(6) C. W. B. asks: I desire to ask your opinion about a certain phenomenon I witnessed some time since. While viewing the moon with a forty-four inch refracting telescope with a power of about sixty, I saw a star pass apparently on the disk of the moon apparently three times its diameter and then disappear. What was the cause of this singular appearance? I have never seen any account in any astronomy of such a phenomenon being witnessed A. The lingering of stars upon the disk of the moon at the moment of occultation is supposed to be due to the principles of diffraction or the bending of rays of light when passing a solid body. Imperfect qualities in the defining power of the telescope may have much to do in the apparent overlapping of the disk of a star. If the telescope was perfect you could scarcely notice that there is disk, under low powers.

[OFFICIAL.]

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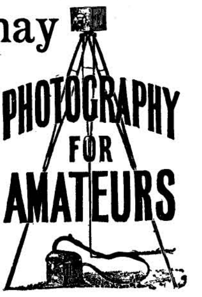

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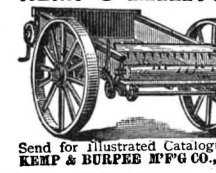

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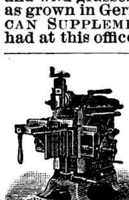

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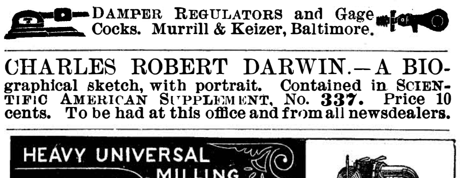

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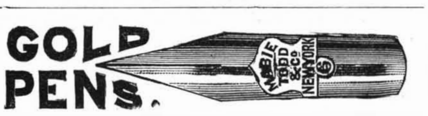

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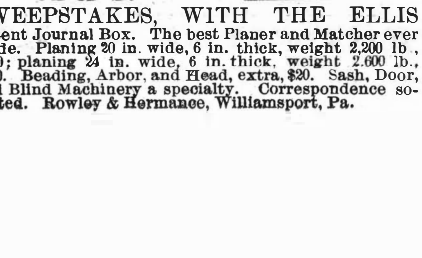

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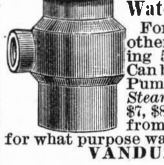

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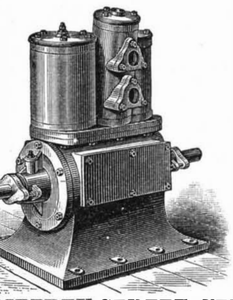

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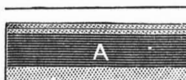

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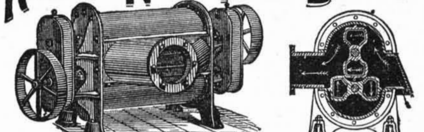

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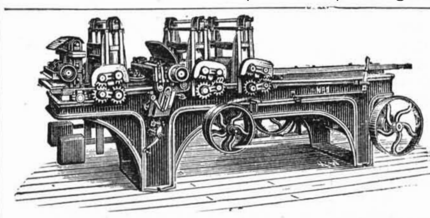

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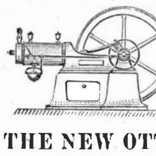

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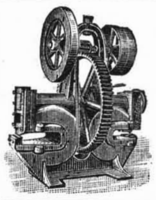

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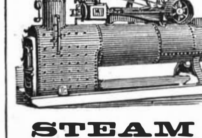

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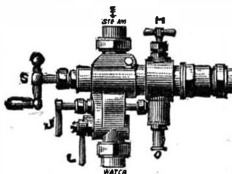

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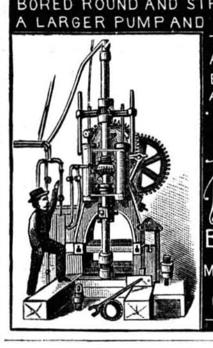

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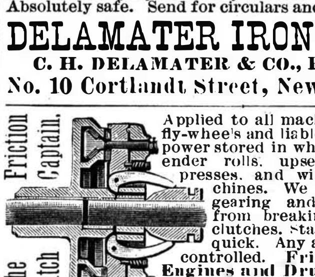

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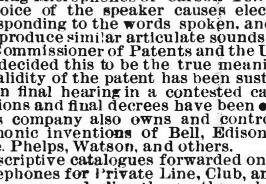

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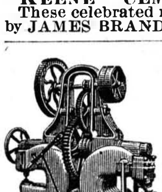

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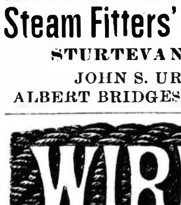

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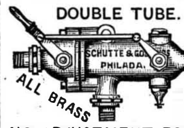

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