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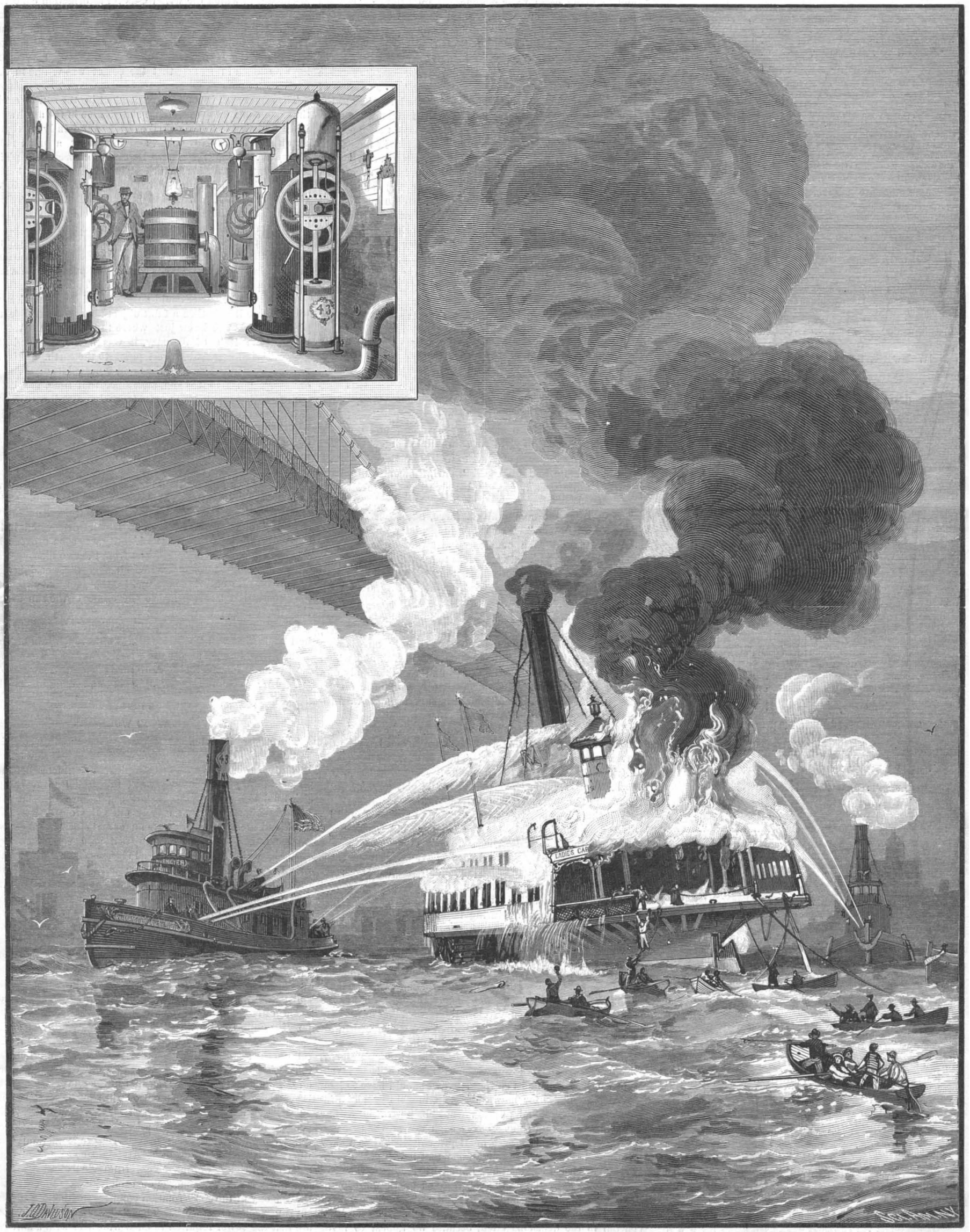

THE FLOATING STEAM FIRE ENGINES OF NEW YORK.—BURNING OF THE FERRYBOAT GARDEN CITY.—[See page 100.]

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NEW YORK, SATURDAY, FEBRUARY 16, 1884.

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(Illustrated articles are marked with an asterisk.)

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THE SCIENTIFIC AMERICAN SUPPLEMENT

No. 424,

For the Week ending February 16, 1884.

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THE POSITION OF INVENTORS.

An accurate conception of the meaning of a patent and of the true status of an inventor is far from common. The fact that inventors are the possessors of a limited monopoly, that is frequently of great value, weighs against them in the estimation of the less enlightened class. To form such a conception, regard should be paid to the opinions of those most familiar with the subjects of inventions, with patent laws, and with the structures themselves. The most enlightened source for an opinion leading to such conception will be found in the decisions of the judges of the courts in which patent rights have been decided. Some of these judges have acquired great eminence in this field. In preparing their decisions they had to study the patents, their scope, utility, and in many cases their commercial importance. Besides having the judicial mind, developed by years of experience upon the bench, they were familiar with the practical aspect of the subject from the studies alluded to.

Of the older judges none attained higher reputation than Judge Story. It is he who gave to Patent Law its famous appellation, "the Metaphysics of the Law." His opinion of the dignity of inventors and the value of their services to the country at large is worthy of record. In one of his early decisions, given over fifty years ago, he says that "patents are not to be treated as mere monopolies, odious in the eyes of the law, and therefore not to be favored." It appears from this that the monopoly part of the question had been even then agitated. But this judge was always opposed to such views as those referred to. In another place he says that the Constitution of the United States, in giving authority to Congress to grant such patents for a limited period, declares the object to be to promote the progress of science and the useful arts, an object as truly national and meritorious and well founded in public policy as any which can possibly be within the scope of national protection. It seems a pity that our Representatives, before considering the bills for the limitation of the rights of inventors, did not study and apply these principles to their actions.

Judge Story declares the protection of patents to be a matter of public policy. How impolitic, then, does the recent action of the House of Representatives appear. But he is not alone in his ideas of the rights of inventors. Other judges at more recent periods reaffirm these views. One, speaking in 1847, says that the true rule of construction in respect to patents is to apply to them plain and ordinary principles, and not to yield to subtleties and technicalities . . . likely to prove ruinous to a class of the community so inconsiderate and unskilled in business as men of genius and inventors usually are. A little earlier Judge McLean had stated that the patent law gives a monopoly, but "takes nothing from the community at large, but secures to them the greatest benefit." The same judge, later on, speaks of the patent right as a compensation awarded the inventor. Following these judicial utterances to a later period, we find patents declared not to be odious monopolies or restrictions on the rights of the public. To still further define the monopoly side of the question, we may quote from Judge McLean again. In 1855 he said: "A monopoly takes from the public what belongs to it, and gives it to the grantee, whereas the right of a patentee rests entirely on his own invention or discovery of that which was useful, and which was not known before." Thus we find the monopoly of a patent declared proper compensation, and a politic one on the part of society. There should be no reason for disturbing it.

If patent lawyers be consulted, they will be found generally of the opinion that a patent is a contract between the inventor and the Government. The case of Ransom *vs.* New York is cited in support of this view. Accepting this as the correct doctrine, the Government would play a poor part in changing the status of patents already granted.

But there is another point of view that may be found indicated in the judicial opinions we have cited. The real policy of the Patent Law is a selfish one on the part of the Government. Vastly greater benefits have been reaped from it by society at large than by the inventors themselves. It has evolved the enormous amount of ingenuity represented by a quarter of a million of inventions. All this work is devoted to the manufacturing industries of the country. By the law only human inventions can be protected, so that no natural principle can be monopolized. It would be hard to imagine where we would stand in the industrial world unbacked by these inventions. If an inventor seems in some instances to receive an undue reward, this is only the exception. It is because of their unselfishness and devotion to the arts that inventors are apt to lose the reward due to their industry and talents. The public often reaps the benefit of inventions long before the patent has expired.

Every American prides himself on his country's progress in this path. With the abrogation of the patent laws invention would cease almost entirely, and we should have to look to other countries for new devices in machinery and processes. The national position would be a humiliating one in place of a proud one. Every such measure as those recently passed in the House of Representatives aims a blow at these laws. We can only hope that it will prove as ineffectual as it is ill-judged and impolitic.

It will be noticed that the views given on the position of inventors favor them and their rights. They are given by eminent judges, who were especially dispassionate and impartial in the decisions cited, because no appeal to favor from them is discernible in the history of such cases. Their opinions would form the safest basis of legislative action, were any needed. But the statute now in force is the fruit of many additions and amendments. It has done well in the past, and is good for some time to come, as it seems reasonably near the goal of adaptability and efficiency. It is not only inventors, but the public at large, that should resist any change in it that will affect its efficiency and range of action. The public are more interested in it than are the inventors. This is no paradox, for inventors are the servants of the public, and protected inventions are the property of the world of industry, withheld from common use for a short term of years.

THE PONS-BROOKS COMET.

We have received a communication from Adamsville, Michigan, in which the writer asks for information concerning a comet he first "discovered about the 18th of January in the southwest, about the same distance from Venus as Venus is from the sun, and a little south, with a tail extending east." He thinks the *Scientific American* was perhaps mistaken in stating that the comet was visible in the northwest.

The comet seen by our correspondent in the southwest is the same comet that was, as we stated, seen in the northwest when first visible to the naked eye. It was faintly perceptible on the 27th of November, and looked like a small nebulous star. About the 21st of December it became a plain though not a conspicuous object in the northwest, being then in the northern constellation Cygnus. It has been visible every clear, moonless night since that time, pursuing its course over the sky with a speed marvelous to behold, having traveled from a position high in the northwest to its present locality low in the southwest. It will continue to move in the same direction till it is so far away as to become invisible in the largest telescopes. It will probably be visible in this latitude till the latter part of February.

The reason the comet could not be found in the northwest was because it was then a faint object almost impossible to pick up unless one knew just where to look for it. When seen on the 18th of January, it was a little beyond its greatest brightness and nearest point to the earth. This it reached about the 14th. On the 26th, it passed its perihelion, or nearest point to the sun, and, since that time, has been our departing guest. The comet's real course is southeast, as any observer who notes its position from night to night will readily perceive. It is carried westward by the motion of the earth, in the same way that Venus is, who, though moving eastward, seems to be moving westward like the stars.

This comet, known as the Pons-Brooks comet, was discovered in 1812 by M. Pons. It was predicted that it moved in an ellipse with a period of 71 years. Therefore, it might be expected to return in 1883. Mr. Brooks discovered it in September of that year, and its identity was soon proved. It was called the Pons-Brooks comet from the two discoverers. The great interest it has excited all over the world is due not to its size or brilliancy, but to the fact that after its long absence it has returned to the clime of the sun at the time predicted by astronomers.

Our correspondent desires information in regard to the best book that will "educate him in the revolution of our planet, also others as far as possible." We recommend Lockyer's "Elements of Astronomy" and Newcomb's "Popular Astronomy" as reliable and comprehensible guides.

PECULIAR WOOD WORKING.

The auger is intended primarily for making holes in wood, yet the only cutting or boring portion is the chisel lip on its lower end; and if the implement could be kept at its work and guided in its course, the gimlet screw at its point and the spiral above its cutting portion might be dispensed with, as the screw merely pulls the cutter into the work and the spiral guides the auger and elevates the chips. So the auger, deprived of these portions, becomes a rotary cutter by which straight or curved recesses of a definite width may be cut. Mortises for tenons are made with such an implement, and it is used also for many other similar purposes.

An adaptation of the circular saw is more peculiar than this. It is the cutting of a wide kerf with a thin saw; thus a saw of one-fourth of an inch thickness, or "set," cuts a score, or slot, of three-quarters of an inch or more. In appearance the saw is anything but mechanical, and at first thought the method is "sloppy" and foolish. But the result of the work is good. The effect is produced by placing a circular saw on an arbor somewhat smaller than the hole through the saw, and canting the saw to an angle by means of convex faced glands or flanges. When rotated the saw's periphery has a "wabbling" motion, so that twice in its revolution the saw cuts out of its true kerf on either side. It will be seen that if the quarter inch saw is set one-quarter of an inch out of truth on its side, it will cut one-quarter of an inch on each side, making, with the primary thickness of the saw itself, a cutting width of three-quarters of an inch. This apparently crude method produces very satisfactory results. It might be supposed that such eccentricity of movement from side to side would leave very coarse score marks on each side of the cut, but the velocity of the saw's rotation compared with the feed insures perfectly clean work. The advantages of this method are that the power required to cut a wide kerf with a narrow saw by gradations is much less than to cut the full kerf at once with full wide cutters, and that while a saw can be

of diameter large enough to cut through a wide or thick piece of lumber, there is a much lower limit to the economical and effective projection of chisel cutters from a head. One of the largest manufactories of agricultural and domestic machinery and implements in the country has used circular saws in this manner for years.

A MENACE TO PROSPERITY.

Sooner or later every act of Congress is brought to the test of Constitutional sanction or to that of practical working. If it fails in the one, it is invalid; if in the other, it is pretty sure to be repealed as soon as its vicious tendency is discovered. Temporary delusion or local or party prejudices may secure the passage of a bad law; but an unjust and impolitic law is not likely to long withstand the will of the multitude, who directly or indirectly suffer by it.

On this ground it is fairly certain that the invasion of the property rights of patentees threatened in certain patent bills now pending cannot long endure, even if by any misfortune they should pass both houses of Congress and receive the Executive signature. Nevertheless, in a single year, such laws as House bills Nos. 3,925 and 3,934 contemplate would prove very hurtful if not widely disastrous to national prosperity.

The influence of new inventions, as a factor of industrial development and national wealth, is sufficiently conspicuous and generally recognized to make unnecessary any extended argument to prove it here. Nevertheless, a few facts bearing upon the question may be not without interest. Official inquiries made some years ago demonstrated the fact that something like nine-tenths of all the manufactures of the country were of articles recently patented or made by patented machines or processes. The same is not less the case to-day. The census of 1880 found our factories turning out products worth, that year, $5,369,000,000, by far the greater part being manufactures involving patent rights. In 1870 the annual products were worth $3,385,000,000, and in 1860 only $1,885,000,000. Thus, in twenty years, the increase had been nearly threefold. Meantime, the United States patents issued had increased in number from 26,641 to 223,210; now they approach 300,000.

Inventions were not the only, perhaps were not among the main, factors of this phenomenal industrial development, but they were an obvious and potent factor, since the advance was chiefly in industries called out or radically modified by recent inventions. In agriculture, the conditions of labor in which had been materially changed for the better by the inventor's labors, the annual product had increased in value from $1,400,000,000 in 1860 to $1,800,000,000 in 1870 and $2,200,000,000 in 1880. It may be a surprise to some to note that the manufactured products of the country now excel in value the agricultural nearly two and a half times. Both these great productive interests increased in value much more rapidly than did the population of the country, demonstrating a largely increased individual capacity of production, thanks wholly to the labors of inventors. In 1860 the population was 31,000,000; it rose to 38,000,000 in 1870, and to 51,000,000 in 1880.

Meantime the aggregate wealth of the country increased from $16,000,000,000 in 1860 to $30,000,000,000 in 1870 and $43,000,000,000 in 1880; all this in spite of the grievous lagacy of debt, depreciated credit, heavy taxation, and all the other evils incident to an exhaustive civil war.

Thus twenty years of unexampled progress were coincident with a period of unprecedented activity on the part of inventors. No one presumes to say that such progress was not desirable and beneficial, or that it could have existed or is likely to continue without a continuance of a like degree of activity on the part of those who more than any others make industrial progress possible.

Yet there seems to be in Congress a majority disposed to change all this by removing the great incentive to inventive effort, the hope of large reward through the inventor's absolute control of his invention for a term of years.

It seems to us that the country has not yet reached that stage of industrial pre-eminence and stability at which it can safely say to inventors, "There is no further need of your efforts," or "We cannot any longer afford to protect you in the ownership of your inventions."

Our example in the matter of liberality to inventors has set half the world at work along the same line of policy, looking to the development of useful arts and manufactures through increase of invention called out by guaranteeing to inventors some chance of profit from their labors. Everywhere (save in the House of Representatives) the tendency is to increase rather than lessen the inducements held out to inventors and introducers of new inventions; and other nations are not likely to take the back track if we do. Hitherto the advantages of liberal patent laws have been on our side; reverse this condition of things, and how long will we be able to lead in the industrial race?

Curiously, those legislators who profess to be most anxious to extend and expand our foreign trade, to build up an American mercantile marine, and all that, are those very ones whose anti-patent tendencies would soonest make it impossible for Americans to command their home market, much less invade successfully the neutral markets of the world in competition with our increasingly inventive rivals. The last improvement in any article commands the trade; if we cease to make these improvements, or the majority of them, our hope of ever attaining commercial eminence will have nothing to rest on.

But a more immediate menace to our industrial prosperity appears in those bills which take away the legal safeguards of the patent rights of those establishments which contribute most of the five billion dollars annual product—a product that would in two years purchase all the farms of the United States at their assessed value. Deprived of the power to defend in the courts their property against infringers, there would be little to induce manufacturers to undertake the commercial development of a large part of the most widely useful of all new inventions; and millions of dollars now invested in the manufacture of specialties would be lost, or withdrawn for safer uses. To take from the patentee the absolute control of the manufacture and sale of the article patented would in many, perhaps most, cases forbid his making any effort to develop it, or prevent his getting financial assistance for such work; for who would run the risk of proving the utility of an invention and making a market for it when the control would be wrested from him as soon as his pioneering and perhaps very expensive work was done?

The experience of Canada and other British colonies that hoped to enjoy "free trade in inventions," in other words get for nothing the inventions of other nations by allowing no patent rights for foreign inventions, is instructive here. Naturally the plan failed. So long as foreign inventions were free to all, no one cared or dared to bear the expense of introducing them; their manufacture began as soon as protection was given to manufacturers under patent rights, insuring an absolute though temporary control of any new industry they might establish.

Our manufacturing interests are too vast and too intimately dependent on patent rights to endure a wanton disturbance of such security without national injury. Even the threat of such disturbance should call out protests from every honest manufacturer.

THE FEBRUARY FLOODS.

At Wheeling, Pittsburg, and Cincinnati, great damage has been done this year by the rapid and great rise of the Ohio River and its tributaries. The snow fall had been large, and for nearly thirty days the temperature has been high, while a good deal of rain has fallen. This has, of course, made rushing torrents of all the feeders of the Ohio which rise in the elevated portions of Western New York, Pennsylvania, and Virginia. Nearly every year floods similarly caused do more or less damage, but last season's loss was so great on this account, that most people will be surprised that such great disaster could be inflicted in two following years. Last year the water in the Ohio at Cincinnati reached a depth of 66 feet; on the evening of Feb. 8, it had reached 63 feet, and gave promise of reaching the extent of last year's flood. Large numbers of people were compelled to leave their homes, most of the railroad communications of the city were interrupted, and there was great damage to property, although there appears to have been no loss of life.

At Wheeling one-half of the city was submerged, men, women, and children having to be removed from their houses by small boats stopping at the windows. About the railway stations only the stacks of the locomotives were to be seen, and numbers of factories were inundated.

At Pittsburg a large portion of the business part of the city was flooded. Between five and six thousand buildings were flooded, including the homes of 25,000 people.

Besides these principal losses there was much damage done at many smaller places on the Allegheny, Monongahela, and lesser streams, as well as on the Ohio; but the principal disasters have been on the Ohio and its tributaries.

A REMARKABLE PHENOMENON SEEN AT SULPHUR SPRINGS, OHIO.

A correspondent in Sulphur Springs, Ohio, refers to THE SCIENTIFIC AMERICAN of the 19th of January, which contained an account of a remarkable phenomenon seen in Porto Rico on the 21st of November. He also describes a wonder of the sky seen about that time in Sulphur Springs, though he is not certain as to the exact date. The phenomenon was witnessed by several observers besides himself.

The object was seen in the southwest in a vertical position. It consisted of a bright nucleus in the center with two tails, one pointing downward and the other upward. The nucleus, observed in a four-inch refracting telescope, under a power of 20, was ruddy in color and quite bright. Our correspondent incloses a sketch, giving the general view as it appeared to the naked eye, though the nucleus is represented as it was seen in the telescope.

We can give no explanation of this strange phenomenon. It was not a comet, or it would have been visible all over the northern world. Its conical form suggests the zodiacal light, and this soft, faint column of light has already been observed and described as unusually brilliant, as well as in advance of its usual period of visibility. It is seldom seen in this latitude until February and March.

The zodiacal light is a lens-shaped appendage of a mysterious nature surrounding the sun and extending a little beyond the earth's orbit. As seen from this planet, it extends upward from the sunset point nearly in a line with the ecliptic, or sun's path, reaching to a point in the heavens near the Pleiades, but has no appearance of a nucleus.

In the tropics the zodiacal light is almost constantly visible, and is sometimes sufficiently luminous to cause a sensible glow in the opposite quarter of the heavens. It is of a ruddy hue, especially at the base, where it is brightest, and puts out the light of the small stars. Sometimes undulations and flashes mingle with its soft, nebulous light.

We are, however, inclined to think that the celestial phenomena observed at Hamacas, in Porto Rico, and at Sulphur Springs, in Ohio, are connected in some unaccountable way with the superb afterglows that have formed a delightful feature of the season. Flashing lights, flaming banners, varied and fantastic cloud-forms, and every imaginable tint of color have diversified the sky, and made the winter of 1883-84 one long to be remembered for its brilliant sunsets and sunrises. The phenomenon is ascribed to the presence of volcanic dust, meteoric dust, or moisture. We may never discover the cause of the gorgeous illumination that has surrounded the path of the setting and the rising sun, but it will be long before we shall cease to remember its result.

PATENT OFFICE WORK OF 1883.

The Hon. Benjamin Butterworth, Commissioner of Patents, submitted his annual report to Congress Jan. 29. From it we learn that the total receipts of the office for the year 1883 were $1,146,240, and the expenses $675,234. There was in the Treasury to the credit of the Patent Office, at the commencement of the year, $2,205,471; and adding the excess of receipts over expenditures for the twelve months, this fund amounted, on the 1st of January last, to $2,676,476.

The total number of applications relating to patents was 34,576, of which 33,073 were for inventions, 1,238 for designs, and 265 for reissues. There were 2,741 caveats filed, 915 applications for registry of trade-marks, 834 for registry of labels, 18 disclaimers, and 640 appeals, making a total of 39,724 cases for investigation and action.

The number of patents issued in 1883, including designs, was 22,216, and there were 167 reissues, or a total of 22,383, against 19,267 patents and reissues in 1882, and 16,584 in 1881. There were also 902 trade-marks registered in 1883, and 906 labels, while 8,874 patents expired, and 2,366 were withheld for non-payment of the final fee.

New York State received the largest number of patents, 4,359, Massachusetts following with 2,173, and Pennsylvania with 2,168; then come Illinois with 1,792; Ohio, 1,604; Connecticut, 883; Michigan, 727; Indiana, 712; Missouri, 625; California, 596; Iowa, 445; Wisconsin, 394; Rhode Island, 327; and Minnesota, 310. The United States Army is credited with 6 and the Navy with 3 patents. According to population, the District of Columbia received one patent on the average for 318 inhabitants, Massachusetts one for 320, Connecticut one for 705, and Rhode Island one for 845, the fewest patents in proportion to population being issued to Mississippi, which received one for an average of 22,188.

The patents issued to citizens of foreign countries numbered 1,259, or 124 more than were so issued in 1882. England takes the lead with 435, followed by Canada with 251, Germany 235, France 179, Austria 33, Switzerland 22, and Belgium 20.

The Commissioner closes his report by directing attention to the inadequate room allowed for conducting the great and steadily growing business of the Patent Bureau, the insufficient force, and the necessity for paying better salaries to command a higher grade of talent in the examining corps. Similar views were expressed by Commissioner Marble last year, but they were unheeded, and the growth of the business now invests them with added force. It is not as though the cost of such additional help and improved service were to be made at the expense of the tax payers, for the funds therefor have already been accumulated from the fees paid by patentees, and it is no more than justice that sufficient should be appropriated from the receipts to insure the best possible administration of the business of the office.

Removing Stains from Cotton or Linen Goods, Curtains, etc.

Grease spots are best removed by soap; stains from oil colors, as a rule, do not resist the action of a mixture of soap and caustic potash. If spots of tar or axle grease are unaffected by soap, they will usually yield to the solvent action of benzine (so-called), ordinary ether, or of butter, which may afterward be removed with soap and water. For ink stains, dilute hydrochloric acid, which must subsequently be carefully washed out, will generally be found effectual. For the same purpose oxalic acid or salts of sorrel (hydrogen potassium oxalate) may also be employed, and that most economically, in fine powder to be sprinkled over the stains and moistened with boiling water.

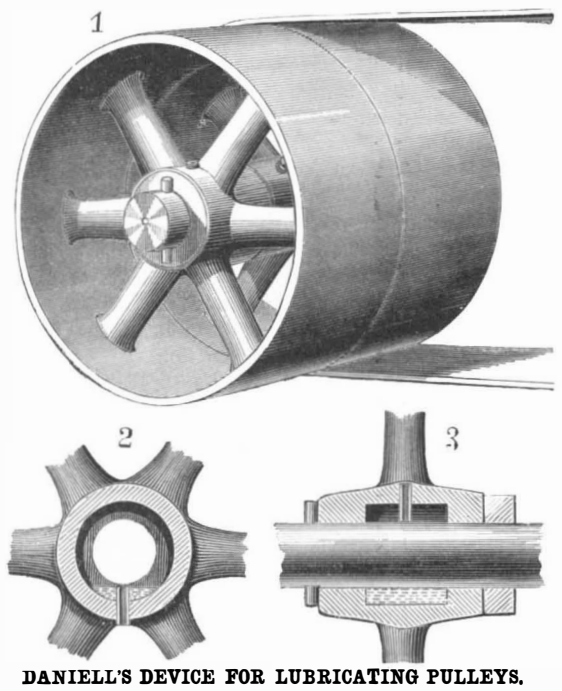
The action of these solvents may be hastened by gently rubbing, or still better, by placing the stained portion of the fabric in contact with metallic tin. If there is much iron rust to be removed, dyer's tin salt (stannous chloride) will perform the work at less expense than the oxalic acid compound. Another solvent for such stains consists of a mixture of two parts argol with one part powdered alum.

Bilberry stains usually yield to the stains of burning sulphur. Stains caused by red wine, white wine, and fruit juices in general are treated successfully with salts of sorrel or with solution of hypochlorite of soda. The latter especially must be carefully removed when the ends have been attained.

Another well-tried plan, when space is available, is to spread the stained fabric on the ground in the open air, smear the spots with soap, and sprinkle ground potash or common salt upon them. Water is added and replaced when lost by evaporation. After two or three hours' exposure the whole fabric may be washed, and will be usually freed from its stains.—*Industrial Record.*

DEVICE FOR LUBRICATING WHEELS AND PULLEYS.

The lubricating hub herewith illustrated is designed for loose wheels and pulleys of different kinds, including car, wagon, or carriage wheels running loosely upon their axles. The hub portion of the pulley, shown in cross section in Fig. 2 and in longitudinal section in Fig. 3, is made with the usual oil receptacle or chamber extending around the interior of the hub and in open communication with the bore. Ordinarily the oil is introduced through a simple radial hole in the hub, so that when the wheel is rotated or left standing with the hole in a downward position much oil escapes. In the case of loose running wheels of cars used in mines it is seldom that the hole in each hub will be in such a position that oil can be poured in, and consequently the car has to be moved in order to bring the holes into proper position.



DANIELL'S DEVICE FOR LUBRICATING PULLEYS.

The waste thus caused is, to a large extent, at least, avoided by inserting or casting in the hub a tube, in open communication with the exterior of the hub and arranged to project within the chamber to the full extent of its depth, so that its inner end is in line with the walls of the bore. By means of this tubular feeding projection within the chamber the oil, when once put in, is prevented from escaping by any way except that which serves to lubricate the axle. Made in accordance with this plan it does not matter in what position the wheel is allowed to stand, since the oil cannot find a passage to the inner opening of the tube. This is shown clearly in Fig. 2, in which the tube is directly beneath the axle.

This invention has been patented by Mr. William P. Daniell, of Girardville, Penn.

High Buildings in Cities.

Old fashioned people, as well as some who cannot claim that designation, are not generally disposed to look with approval on the increasing number of high office buildings and residence flats in all our large cities. Perhaps most of the dangers from fire, in nine, ten, and eleven story structures, are removed by the exclusive use of brick, stone, and iron, not only for walls and staircases, but for ceilings and partitions. But, even if this be so, there is yet room for the conviction that many apartments are so filled with furniture and other combustibles that it would require no strange occurrence of circumstances to convert one of these great structures into a vast smoke house, where suffocation might be as fatal to many as the flames have frequently been in other cases. Besides, there are many who doubt that all of these said-to-be fireproof structures would really be so if put to a severe test.

Of much greater importance, probably, than the above considerations are the hygienic questions involved in the building of so many of these great apartment houses. Dr. S. Oakley Vanderpoel, in a recent paper read before the Medical Society of New York, says that in them it would be impossible to properly isolate the sick in the case of a general epidemic; that either through necessary attendance, contaminated clothing, or currents of air, the epidemic poison would be carried to all occupants. The air shafts from the bottom to the top, into which open windows from each floor, make facile means of distributing poisoned air, which any defect in plumbing or accident in the water or soil pipes might give rise to. It is also pointed out that such structures have a baneful effect in shutting out sunshine from the streets and from surrounding houses, so that private dwellings before cheerful and healthy become gloomy and unhealthy.

In striking contrast with these conditions in house building here, we note the subject of a paper recently read by Mr. John Honeyman, before the Sanitary Institute, Glasgow, Scotland. There, it seems, it is proposed, in a police bill draughted by the Corporation of Glasgow, that on land bounded by a new street forty feet wide, dwellings shall not be more than two stories high. In this case it is supposed the tenements will be in stories of ten feet high each, but the writer argues, with a detail which seems quite superfluous to us here, in favor of allowing the buildings on a street of that width to be four stories high, each story of eight feet, claiming that such a building is not too high where land is valuable, and that rooms eight feet high will ordinarily be as well ventilated as those ten feet high. This, indeed, seems like flying from one extreme to the other.

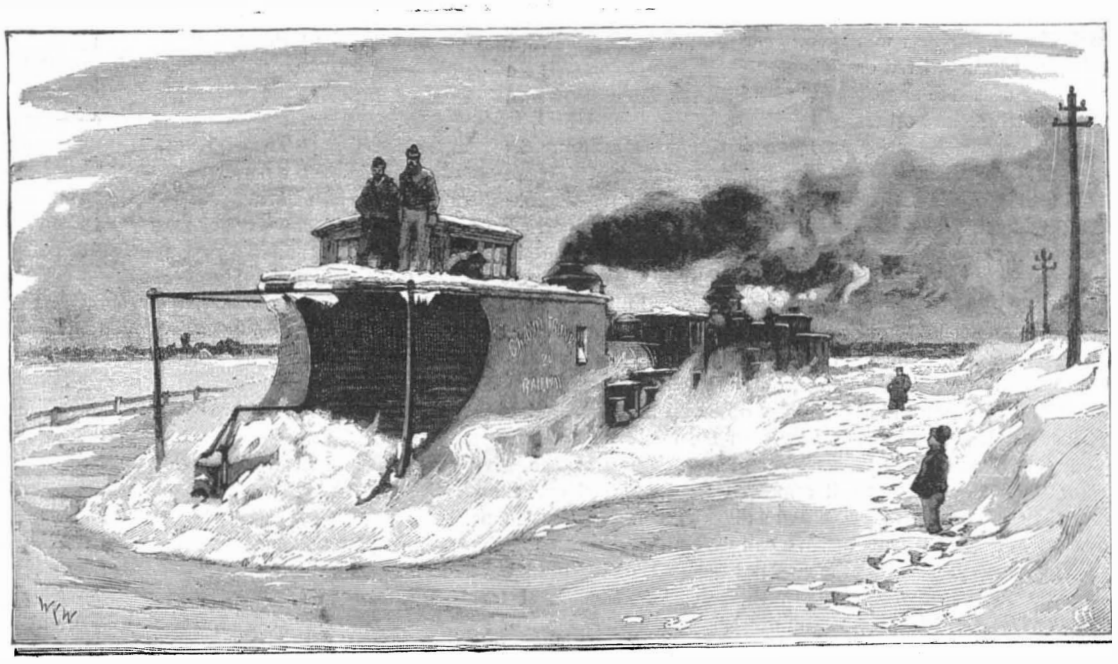
Bellows for Insect Powder and Liquids.

It is now well known that emulsions of kerosene are our best insect exterminators. Persian insect powder (the ground leaves of certain Pyrethrums), hellebore, sulphur, etc., are also valuable. But their application has hitherto been laborious and uncertain. Two years ago we began to use several kinds of bellows known as the Woodaston bellows, for sale by most seedsmen. They are made in different sizes, costing from one dollar upward—one set for the use of powders, the other for liquids. The latter are constructed on the plan of the little "evaporizers" sold by druggists, except that instead of pressing a little rubber bag to induce the spray, we use the handles of the bellows, the same as if "blowing the fire."

Previous to their use we had poured kerosene upon the perches, in the cracks and nests of our hen houses to rid them of vermin. Now we use the bellows, and the spray reaches every crevice and hole, while one-tenth the quantity serves and the operation is performed far more effectually in one-tenth the time. These bellows will project a fine spray for six feet, so that vines, small trees, or plants infested with aphides, bark lice, or insects of any kind may readily be reached. The powder bellows serve just as well for sulphur, hellebore, Paris green, and the like, as the spray bellows do for liquids, and we commend their use to all of our readers who are obliged to fight insect foes, whether in the hennery, kitchen, conservatory, garden, or field.—*Rural New-Yorker.*

A CANADIAN SNOW PLOW.

We in England know comparatively little of the inconveniences of winter, and although we hear occasionally of a train being snowed up in the North, the occurrence is so rare that it is chronicled in the journals as an instance of unduly severe weather. Across the Atlantic, however, in the northern portion of the United States and in Canada, the winter is so long and severe—this week the thermometer marked 48 degrees below zero in Dakota—that the railway authorities have to make great preparations for the safety of their traffic. Not only are bridges roofed over to prevent the accumulation of a mass of snow which might eventually break down the structure, but large steam plows are

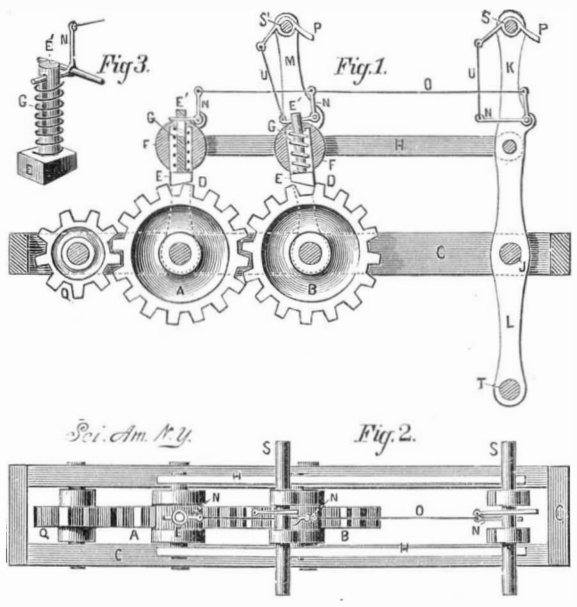


A SNOW PLOW ON THE GRAND TRUNK RAILWAY, CANADA.

constructed, which, propelled by several locomotives, are capable of penetrating and clearing away huge quantities of snow from the line, through which no locomotive unaided could possibly force its way by itself. Many of the locomotives are fitted, in event of emergency, with small snow plows of sheet iron, sharp edged and backed with stout timbers. These, however, frequently prove insufficient, and passengers have to turn out of the carriages to assist in shoveling the snow off the line. The plow in our engraving, however, is a far more serviceable apparatus, and with good steam power behind it can clear away a great depth of snow off the track.—*London Graphic.*

MECHANICAL MOVEMENT.

The device herewith illustrated consists of a pair of toothed wheels geared together, and so arranged that continuous rotary motion is communicated to the wheels, one pawl acting on one of them when the lever moves in one direction and another pawl acting on the other wheel when the lever moves the other way, the wheels thus driving in the same direction, but turning in opposite directions. On a suitable frame, C, are geared two spur-toothed wheels, A B. Pawl levers, D, are set so as to act on the teeth of the wheels for driving them in opposite directions. The pawls are formed on the ends of short rods, E_1, that are fitted to the sockets, F, of the pawl levers for being worked by them, and they rise and fall in the sockets in order to pass over and drop into the teeth for working the wheels, the springs, G, forcing them down. The pawl levers, D, are connected to a working bar, H, which is to be reciprocated by power applied



KUBEC'S MECHANICAL MOVEMENT.

to it in any approved way. A lever, L, may be pivoted to the frame, C, and have one arm, K, worked by hand, and the other by the feet. One or both of the pawl levers may have an arm, M, by which the power may be applied by hand, the lever, L, being dispensed with. The pawls are connected to trip levers, N, by which they may be raised out of contact with the wheels, when it may be required, to permit the working lever to be shifted to a more favorable point for starting the machine. The trip levers are connected to a rod, O, worked by a hand lever, P, on the power lever, when it may be worked at the same time that the hands are employed on the power lever, the hand lever being connected to any one of the trip levers by a rod, U. The power may be transmitted from the wheels, A B, by a pinion, Q.

An important feature of the device is that power may be applied by long or short strokes which may be varied within a considerable range, according to the number of teeth the pawls may be made to take at each operation. The leverage of the transmitting gear may thereby be varied, according as the work is light or heavy.

This invention has been patented by Mr. Frederick Kubec, of Riverside, Iowa.

Church Fires.

The *Chronicle* states that nearly eight hundred churches—an average of about eight per month—have been destroyed by fire in the United States in the past nine years. According to the fire tables of the aboved named journal, there were one hundred and nineteen churches destroyed during the year 1882, at a loss of $672,170, and a loss to insurance companies of $312,280. Among the principal causes ascribed for these fires are defective flues and heating apparatus and incendiarism. The incendiary is no respecter of buildings, and not only bears his flaming torch through the thoroughfares of our large cities, but also appears at intervals in our smaller cities and obscure country towns. Churches, and particularly those located in country towns, are too often built of the cheapest and weakest material, and present strong temptations to the inherent lovers of fires and easy prey to the fire fiend. Church societies owe it to themselves to pay more attention to the building of their edifices as well as to the prevention of fire.

THE will of the late Sir William Siemens covered personal estate of the value of £382,000. The testator makes provision by his will for the carrying on, under the same management as during his lifetime, of his civil engineering business, including his patented inventions.

Electric Lighting by Primary Batteries.

We have no wish to discourage inventors of primary batteries, but, on the contrary, we would urge them to renewed exertion, for there is a large and we believe remunerative field before them. But let them not spend their time in attempting impossibilities, or in writing treatises to demonstrate facts which were published thirty years ago with much greater minuteness and accuracy. It is not the cost of the zinc which has hitherto prevented the use of batteries, but the expense of the liquids, which generally increases as that of the zinc diminishes, their acid nature and unpleasant fumes, and, above all, the unmechanical construction of the cells and the difficulties caused by corrosion, creeping, leakage, and the like. A battery which was free of these objections would have an extensive sale for electric lighting.

The reason that isolated installations increase so slowly is the prejudice people feel to introducing gas or steam engines, with their attendants, on to their premises, far more than on account of their cost, and if these could be replaced by a series of boxes which would only need skilled attendance once in three months (say), we should find a rapid increase in electric lighting, even if the cost were double or threefold that of gas in large towns.—*Engineering.*

"PERCENTOGRAPH."

The device shown in the accompanying engraving is for reducing common fractions to decimals, and is particularly designed to be used by railroad and other transportation companies for determining percentages and proportions in dividing rates, revenues, or expenses on the basis of mileage; but the uses to which it may be put are extensive, as will be readily seen from the description.

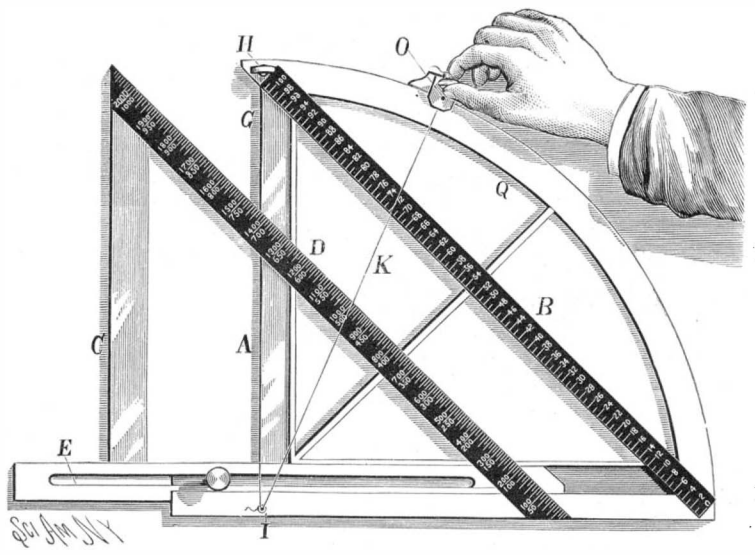
A stationary triangle, A, has a percentage scale, B, arranged along its hypothenuse; a similar triangle, C, is fitted to slide in the fixed triangle, and is likewise furnished with a scale, D, on its hypothenuse, which represents a series of numbers the percentages of which are to be ascertained. The numbers in the scales, B and D, increase from the right upward to the left, the former extending from 0 to 100 and the latter from 0 to 1,000, or from 0 to any number higher than 1,000 according to the value given to the graduations; thus, if each graduation is made to count 2 instead of 1, the scale D will indicate 2,000 as the highest number. In the engraving the scale D is marked off to indicate both 1,000 and 2,000 at the end, two sets of numbers being used, one double the other, to mark the graduations. When the scale D is moved against the scale B the graduations will exactly register with each other, and the percentage numbers will correspond with the numbers whose percentage of 1,000 or 2,000 they represent. The base of the movable triangle is provided with a slot, E, and a set screw by means of which it may be adjusted and held in any given position.

The vertical side of the stationary triangle is provided with a stretched cord, G, or equivalent device, which serves as a marker on the scale D. This cord is connected to set screws, H I, and is arranged at right angles to the base of the triangle. A second cord, K, is attached to a collar loosely mounted on the pin, I, and its other end is attached by a set screw, O, to a slide that moves on a segmental bar, Q, the circle of which is drawn from the pin, I. This cord is used to mark the percentage on the scale, B, and also to mark the numbers on both scales.

If it be desired to ascertain the relative proportion of railroad lines, in interest aggregating say 1,400 miles, move the scale D until 1,400 intersects cord G on its upper edge, then tighten set screw. The cord K is then moved until it intersects the number of miles of road forming a part of the 1,400 miles, when the relative proportion will be indicated on the stationary scale, B. Thus, if cord K be moved until it intersects 490 miles, the scale B will indicate 35 per cent, and remaining distance, 910 miles, in proportion, forming the total 100 per cent. From this it is obvious that the percentage which any part of 1,400 bears to the whole will be indicated on the scale B by moving the cord K to the number of miles required (of the 1,400).

In many instances there are roads which from their position demand an arbitrary proportion, and will not prorate on mileage basis. The percentograph provides for this emergency. For instance, if line Springfield, Mass., to New York demand 20 per cent of any rate on business to Petersburg, Va., thus leaving 80 per cent for lines New York to Petersburg, Va., move the cord K until it intersects 80 per cent on the scale B, then move scale D until 388 miles intersects cord K (distance N. Y. to Petersburg, Va.), then move cord K until it intersects 98 miles (N. Y. to Philadelphia), and scale B will show 20·2 per cent; and so on each road its proper proportion of the 80 per cent, as indicated.

Further information may be obtained from the patentee, Mr. S. J. Tucker, of Richmond, Va., or from Mr. M. S. Foote, of same place.

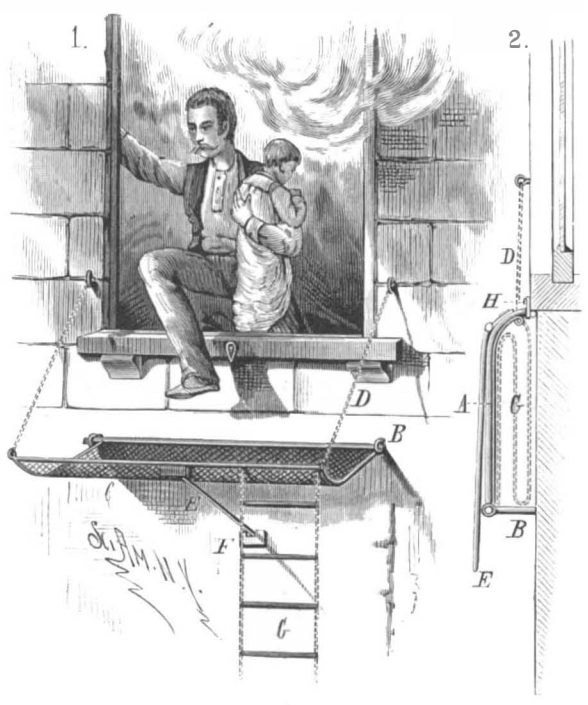


TUCKER'S "PERCENTOGRAPH."

THE relative efficiency of electricity, gas, and oil, for use in lighthouses, is being tested in England, where the Trinity Board has selected certain ranges about three miles inland from the South Foreland lighthouse as lines of observation, along which measurements are to be made. These experiments are expected to last several months.

FIRE ESCAPE.

A frame made of iron or steel bars is pivoted to eyebolts, B, projecting from the wall of the building such a distance below the window that when the frame is held against the wall its outer edge will be below the sill, as shown in Fig. 2. Strong wire netting is secured to the frame, whose outer end is curved upward. Chains, D, are secured to the outer corners of the frame and to the wall or window frame, to hold the frame in a horizontal position when lowered. A brace rod, E, pivoted to the middle of the outer edge of the frame, rests on a projection, F, of the wall. Secured to the frame is a chain or rope ladder, G, which is folded and held within the frame when the latter is not in use. When the frame is swung down the ladder will unfold and the free end will pass down to the ground, or to a like fire escape at the



EYL'S FIRE ESCAPE.

next window below. Persons fleeing from the fire step on the balcony formed by the frame and netting, and then descend by means of the ladder. Fig. 1 is a perspective view, showing the escape in position to be used, and Fig. 2 is a sectional view showing the fire escape folded against the wall.

This invention has been patented by Mr. Emil C. Eyl, of Jefferson City, Montana.

Inventions of a Half Century.

"The number of inventions that have been made during the past fifty years is unprecedented in the history of the world. Inventions of benefit to the human race have been made in all ages since man was created; but looking back for half a hundred years, how many more are crowded into the past fifty than into any other fifty since recorded history! The perfection of the locomotive, and the now world-traversing steamship, the telegraph, the telephone, the audiphone, the sewing machine, the photograph, chromolithographic printing, the cylinder printing press, the elevator for hotels and other many storied buildings, the cotton gin and the spinning jenny, the reaper and mower, the steam thrasher, the steam fire engine, the improved process for making steel, the application of chloroform and ether to destroy sensibility in painful surgery cases, and so on through a long catalogue. Nor are we yet done in the field of invention and discovery. The application of coal gas and petroleum to heating and cooking operations seems to be only trembling on the verge of general adoption; the introduction of steam from a great central reservoir to general use for heating and cooking has been in part a success; the navigation of the air by some device akin to our present balloon would also seem to be prefigured, and the propulsion of machinery by electricity is even now clearly indicated by the march of experiment.

"There are some problems we have hitherto deemed impossible, but are the mysteries of even the most improbable of them more subtle to grasp than that of the ocean cable or that of the photograph or telephone? We talk by cable with an ocean rolling between; we speak in our voices to friends a hundred miles or more from where we articulate before the microphone. Under the blazing sun of July we produce ice by chemical means, rivaling the most solid and crystalline production of nature. Our surgeons graft the skin from one person's arm to the face of another, and it adheres and becomes an integral portion of the body. We make a mile of white printing paper and send it on a spool that a perfecting printing press unwinds and prints, and delivers to you, folded and counted, many thousand per hour. Of a verity this is the age of invention, nor has the world reached a stopping place yet."

Rotary and Reciprocating Steam Engines.

In a recent letter to the *Tribune*, Prof. R. H. Thurston, of the Stevens Institute of Technology, gives the following:

It is assumed that the reciprocating engine is essentially defective; that the conversion of the reciprocating motion of the piston into the rotary motion of the crank and fly-wheel involves, necessarily, some appreciable loss of power and efficiency; that the variation of speed of the reciprocating parts, from a state of rest at the "dead points" to maximum velocity at half stroke, must necessarily cause loss of power, increased wear and tear, and dangerous impact at high speed, and must thus restrict, to a very serious extent, the development of greater power by the adoption of higher velocities of piston. It is these notions which have been the usual stimulus to inventors who have, during the past century, been endeavoring to produce rotary engines capable of competing successfully with the always standard reciprocating machine. The patent records teem with such devices, many of them ingenious, more of them crude and unmechanical.

Rotary engines have usually proved to be wasteful in their use of steam, subject to rapid depreciation in power and efficiency, and to great loss of power by friction of working parts. Engineers are, therefore, likely to look with interest, and with a little surprise, upon a motor of this class which is not subject to these defects, even though it may not prove to be the superior of the best engines of the more common type.

But the assumed objections to the reciprocating form of steam engine are, to a considerable extent, imaginary. The conversion of a reciprocating motion into rotation does not necessarily involve loss of power, and need not, and in good engines does not, cause objectionable jar or injury of the working parts. The limit to the increase of speed of the modern "high-speed" engine is not set by the difficulties of the kind above described met with in its operation, but rather by the impossibility of carrying more than a certain amount of power through fast running machinery with absolute certainty that lubrication may be secured, without interruption for an instant, day after day, indefinitely. The inertia of parts, which has been so generally assumed to be detrimental to the action of the machine, has an equilibrating effect with the irregularity of steam distribution due to the expansion of the steam; and this balance may be adjusted for speeds greatly exceeding even the highest attained by the most radical of the high-speed engine builders of the day. The rotary engine has not, therefore, the advantage in this respect claimed for it in the past by many engineers as well as by non-professionals. It has, however, evident advantages which have been hitherto more than compensated by the apparent impossibility of securing that economical distribution of steam which is easily and satisfactorily obtained in the standard forms of engine, and by the failure of nearly every form of rotary, in competition with the reciprocating engine, when compared with respect to freedom from internal friction and leakage of steam past the piston. It is always safe for the layman, when asked to put his capital into rotary engines, to assume that the machine possesses these defects to a fatal extent, unless the contrary has been proved to be the case by careful tests made by engineers of known skill and integrity.

The engineer is, therefore, pleasantly surprised when he finds one of this class of engines doing good work, and he will be still more pleasantly surprised when he finds the difficulties which have hitherto been met, in the endeavor to secure good steam distribution, high economy, and perfect regulation, such as is seen in the best reciprocating engines, combined with the undeniable special advantages of the rotary engine.

These latter impediments being overcome, the rotary will supersede the reciprocating engine, but I think not till then, except for very small powers. Our small reciprocating engines do not compare favorably with larger sizes, in respect either to economy, exactness of regulation, or power per pound of weight of machine. They are usually capable of great improvement, but a small machine of this class will probably never do as good work as a large one. For the present, at least, the best rotary engines must compete solely with the smaller reciprocating engines.

THE FLOATING STEAM FIRE ENGINES OF NEW YORK.

The immense value of the property lying along the immediate river front of this city, comprising storehouses, docks, and vessels and their cargoes, and the impossibility of effectually guarding it against fire, because of its inaccessibility except from the shore side, made imperative the adoption of some means of protection from the water side. Several years ago the steam propeller Wm. H. Havemeyer was equipped for the service, and, with steam constantly up, manned by an efficient and well trained crew, has never delayed responding to an alarm. It is difficult to estimate the importance of the services rendered by a boat of this description in confining a fire to the locality in which it started, yet this is one of the most essential duties of the river branch of the department. But some idea of the work required may be formed from the fact that during the year 1883 this boat responded to 139 alarms. At the warehouse fire in East Street, which began January 14 last, the pumps were running full capacity for 3 days, and the boat was kept on duty for 19 days, during which she worked for 413 hours.

But the territory to be protected is large, and last year a second boat—the Zophar Mills—took its station on the river. This boat is larger than the Havemeyer, and furnished with more powerful machinery, yet the general plans of the two do not vary essentially. They look like large tugs.

The Havemeyer, shown on the left in our engraving, is 115 feet long, is built of wood, and is provided with two double pumps of the Amoskeag pattern, of 5 inches diameter by 12 inches stroke, so arranged as to be worked either combinedly or independently. There are eight streams, all or any of which may be used, arranged to deliver from either side of the boat. When working full capacity, the pumps will deliver 1,400 gallons of water per minute, which is about equal to five first-class fire engines.

The Zophar Mills has an iron hull, is 126 feet long, and has two pairs of duplex pumps 7½ inches by 9 inches, with steam cylinders 16½ inches diameter. These engines will throw 2,200 gallons per minute through eight pipes, and will throw a two-inch stream 300 feet.

Each boat has a boiler capacity in excess of that required for pumping, in order that she may be propelled at the same time her pumps are in operation. The speed is about 12 miles per hour. These boats have delivered a large stream through 1,000 feet of hose. The Havemeyer is kept at the Battery and the Zophar Mills at Thirteenth Street, North River.

Our engraving vividly illustrates a fire where the services of these boats could not be replaced—a fire in mid-stream, and almost directly under the flooring of the great suspension bridge. On the morning of December 13, 1883, the double deck ferry boat Garden City, plying between James Slip, this city, and Long Island City, was discovered to be on fire just after she had left her pier on the up trip. The superstructure being light wood the flames spread rapidly, and the upper deck was enveloped before help arrived. Streams from several tugs which happened to be in the vicinity were turned upon her, and the progress of the fire was considerably checked, but not until the arrival of the Havemeyer was there a sufficient supply of water to confine the fire with any degree of certainty. As soon as possible the boat was towed to the shore, where fire engines were waiting to lend their aid. As it was about noon there were but a few passengers on board, all of whom escaped without injury.

The small engraving represents the engine room of the Havemeyer.

Tree Planting.

So small would be the money outlay, so inconsiderable the labor required, to insure for the next generation a wealth of timber land equal to that of which we have the benefit, and shade and shelter trees in even more adequate supply, that it is a great wonder to us, amid all the forcible facts brought forward against the rate at which forest destruction is going on, there has been no more general movement in favor of tree planting. In Germany and Austria, for upward of half a century, the number of trees planted has borne a good proportion to those annually cut down, and it is certain that this is the case now, year by year. In France, Italy, and England, also, tree cultivation is now general, and is held to be a most important matter of public concern. But here, with the characteristic improvidence which has come to be considered a marked feature of American character, we are destroying our great virgin forests with a rapidity never before equaled in any other country, and without taking any measures to insure their future growth.

Spurious Tartar Emetic.

M. Castelhaz has in a recent circular called the attention of consumers to the sophisticated, or rather spurious, samples of antimony potassium tartrate now in market. This compound is used on the large scale for fastening certain coal tar colors upon cotton, and being of course costly the attempt has been made to employ the corresponding oxalate as a substitute. The effects of this new salt both upon the fiber and upon the colors are not in all cases satisfactory, and its admixture with, or clandestine substitution for, the double tartrate is certainly a fraud. For its detection the following simple test is proposed: A portion of the sample is dissolved in distilled water, acidified with pure acetic acid, and a solution of calcium chloride is added. If an oxalate is present a white precipitate is formed, while in case of a genuine double tartrate the solution remains clear.

Women as Inventors.

A writer in the *North American Review* gives the following list of inventions recently patented in the United States by women. But the writer has omitted from his list a large number of patents which have been granted to the fair sex, some of which have proved of considerable value to the patentees.

The writer commences his list with a spinning machine capable of running from 12 to 40 threads; a rotary loom doing three times the work of an ordinary loom; a chain elevator; screw crank for steamships; a fire escape; a wool feeder and weigher, one of the most delicate machines ever invented, and of incalculable benefit to every wool manufacturer; a portable reservoir for use in case of fire; a process for burning petroleum in place of wood and coal for steam generating purposes; an improvement in spark arresters, to be applied to locomotives; a danger signal for street crossings on railways; a plan for heating cars without fire; a lubricating felt for subduing friction (the last five all bearing upon railroad travel); syllable type, with adjustable cases and apparatus; machine for trimming pamphlets; writing machine; signal rocket used in the navy; deep sea telescope; method of deadening sound on elevated railways; smoke burner; bag folding machine, etc. Many improvements in sewing machines have been made by women—as, a device for sewing sails and heavy cloth; quilting attachments; the magic ruffler; threading a machine when it is running; an adaptation of machines for sewing leather, etc. This last was the invention of a practical woman machinist, who for many years carried on a large harness manufactory in New York city. The deep sea telescope, invented by Mrs. Mather and improved by her daughter, is a unique and important invention, bringing the bottom of the largest ships to view without the expense of raising them into a dry dock. By its means wrecks can be inspected, obstructions to navigation removed, torpedoes successfully sought for, and immense sums annually saved to the marine service. A machine which, for its complicated mechanism and extraordinary ingenuity, has attracted much attention both in this country and Europe, is that for the manufacture of satchel-bottom paper bags. Many men of mechanical genius long directed their attention to this problem without success. Miss Maggie Knight, to whose genius this machine is due, it is said refused $50,000 for it shortly after taking out her patent. Miss Knight has since invented a machine doing the work, the writer says, of 30 persons in folding bags, and herself superintended the erection of the machinery at Amherst, Mass.

An Electric Microscope.

A number of gentlemen lately assembled at the exhibition court of the Crystal Palace, by invitation of the directors, to witness the first representation in England of *Les Invisibles*, an exhibition of natural objects magnified and displayed by means of the great electric microscope. The apparatus used in the exhibition is the invention of Messrs. Bauer & Co., and *Les Invisibles* has quite recently attracted a good many visitors to the old Comedie Parisienne, where, as well as at the Athenæum at Nice, a series of representations has been given. The invention may be described in a few words as being the application of electric light to the microscope, and the result, so far as the spectacle is concerned, is a sort of improved and enlarged magic lantern. Every one is familiar with the former exhibitions at the Polytechnic and elsewhere of the animalcules in a drop of water, magnified and thrown, by the aid of the lime light, on to a white screen. Precisely the same sort of effect was produced on Saturday by Mr. F. Link, the London agent for Messrs. Bauer & Co., with this difference, that the magnifying power was enormously in excess of that attained in the old magic lantern entertainments. The electric microscope has, in fact, made it possible to exhibit in a most attractive form the appearances presented by minute natural objects when placed under the most powerful magnifying glass. Indeed, the difficulty with which Mr. Link had to contend on Saturday was the smallness of the screen upon which his pictures were thrown. For instance, only a small section of a butterfly's wing could be shown at a time, although the screen was as large as the size of the entertainment court would permit, while the living organisms in a spot of water and the mites in a small piece of cheese were enlarged until they presented a perfectly appalling spectacle to a timid mind. The capabilities of the apparatus may be imagined from the fact that the eye of a fly was presented in a form no less than four million times its natural size. The electric microscope, which is worked by an ordinary primary battery, may be said to have extended almost indefinitely the possibilities of presenting in an attractive and instructive manner the wonderful facts of natural science.

Death of Dr. Elisha Harris.

Dr. Harris, the Secretary of the New York State Board of Health, aged 60 years, died in Albany, January 31, from peritonitis. In 1855, he was placed in charge of the New York quarantine, the details of whose system he perfected, establishing in 1857 the floating hospital below the Narrows. During the Civil War he was a member of the National Sanitary Commission, and devised the railway ambulance, afterward adopted in the German army. Dr. Harris has been conspicuously active as a member of the city and State Boards of Health, and in 1869 took a leading part in making the first thorough tenement house sanitary survey in New York city. In the way of compulsory ventilation of dark bedrooms, over 50,000 windows were put in according to his suggestions. He was also very active in establishing the system of public vaccination. Dr. Harris was identified with the Association for Improving the Condition of the Poor, and was a member of the County Medical Society, the New York Academy of Medicine, the Physicians' Mutual Aid Association, the Society for the Relief of Orphans and Widows of Medical Men, the *Medical Journal* Association, and the Public Health Association of New York. He was also an active or honorary member of various other associations and societies in this country and Europe. He was consulting physician to the country branch of the Nursery and Child's Hospital. He was a voluminous writer of works on sanitary and philanthropic subjects and also on questions relating to vital statistics.

Milk Diet in Bright's Disease.

Since we know not at present any drug that possesses therapeutic value to any marked extent in this terrible and fatal disease, and since it is daily making sad havoc among human beings, and principally among that class who, by reason of their valuable public labors, are particularly necessary to the welfare of the world, therefore, it becomes a medical question of paramount interest that we should discover some potent method of combating this very prevalent disease. Some years since Carel first called attention to the treatment of Bright's disease by the use of a milk diet, and since then Duncan, as well as many other prominent physicians, has written on this subject.

We have ourselves seen some remarkable results follow this treatment, while Dr. S. Weir Mitchell, of our city, is now quite an enthusiast on this subject. This method of treating a formidable disease has received sufficient distinguished indorsement to recommend it seriously to our notice. We would, therefore, ask all physicians who read this article to try this method of treatment and to furnish us with their experiences, which we will publish. The milk is used thoroughly skimmed and entirely freed from butter. To procure the best results, it has been advised that the patient shall restrict himself absolutely to milk and continue the treatment for a long time. If it disagrees with the stomach (as it will in some cases), Dr. Mitchell advises that the patient be put to bed and the treatment commenced with tablespoonful doses, to which lime water is added, until the stomach tolerates the milk, when from eight to ten pints daily should be taken, and absolutely nothing else. The sanction of such a distinguished physician as Dr. Mitchell forces us to seriously consider the merits of this treatment, and we trust to receive the experience of all readers of this journal who may have cases of Bright's disease to treat.—*Med. and Surg. Reporter.*

Built Up Wood.

Several thin sheets of wood—they are called veneers, though they are sometimes an eighth of an inch thick—are glued one upon another, with the grain of each sheet crossing the grain of the sheet next above or below it at right angles; and, when the whole complex fabric has lost all power of resistance through being almost saturated with steaming glue, it is pressed into an almost homogeneous board without any cleavage whatever, and so without possibility of splitting. Every sort of wood, of course, can be built up. The inside layers can be cheap and the outside choice. No matter whether or not the different sheets naturally swell and shrink evenly together. They are too thin to exert much force. Their separate identities are lost in the common and overmastering union. The advantages of economy, strength in every direction, and immunity from cracking are enough to give the fabric the readiest possible acceptance for whatever uses it may be adapted. It is already in use for broad, flat surfaces in cabinet work, especially where strength or permanence is wanted. It already competes with canvas for the use of artists, and with binders' board for book covers. Its availability for any purpose appears to be a matter of expense and skill—never of quality. That it will be adapted to many uses not now thought of is as sure as the inventive fertility of our mechanics.

Weighing Silver Dollars.

In the mint at San Francisco there are fifty women employed at a salary of $2.75 per day. The hours are from nine o'clock in the morning until four in the afternoon, with the exception of Saturday, when work ends at two. Their business is to weigh the gold and silver after it has been rolled, annealed, cut, and washed, and they are known as adjusters. Each piece should weigh 412½ grains for a silver dollar to be up to the standard, a slight discrepancy being allowed on either side. If a coin is found to be outside the limit, it is returned by the adjuster; if too light, it is condemned, and must be remelted; if too heavy, it is filed to its proper weight.

The Reis Telephone of 1864.

Mr. H. F. Peter is a teacher of music in the village of Friedrichsdorf, Germany, which was for many years the home of Philipp Reis, and which contains the Garnier Institute, where he was instructor in physics. Herr Peter states that he was present at Reis' experiments, and can testify that audible speech was actually reproduced by his telephone. He says that many members of the "Physikalischer Verein," of Frankfort-on-the-Main, were also present.

Correspondence.

The Life Line Mortar for Ships.

To the Editor of the Scientific American:

In your Feb. 2, 1884, number, "Life Saving Appliances at Sea," I was very much impressed with the idea you brought out of how impotent the saving appliances are in a heavy sea.

It appears to me, that the first piece of apparatus a vessel should possess would be a mortar for throwing life lines; it could always be loaded, fuse, hammer, cap, and line attached, and ready to be fired in a few seconds.

All the life saving stations are equipped with a mortar, and are found to be of great use. It would be so much easier and sure to throw a line to the shore than from the shore to vessel.

If a wreck occurred at some distance from a station, a line could be thrown from the vessel and passengers landed before the apparatus could be brought from the station.

Equally important, at sea, to make connection between two vessels when the sea is very rough, in which a boat could not live. A. S. P.

Paterson, N. J., Feb. 4, 1884.

"Pneumatic Propulsion" Revised.

To the Editor of the Scientific American:

In your paper of February 2 Mr. Henderson takes me to task for my "erroneous ideas as to the action of the air on the water." Now, I am very ready to acknowledge my errors, but I am also very ready to stand up for the right, and, inasmuch as your correspondent did not succeed in striking one of my manifold delinquencies, but took that which was just the reverse, he was not successful in his criticism.

He says "the air on escaping from the nozzle would pass along between the keels in a solid body," and in this way the friction caused by the air, "instead of assisting to propel the boat forward, would be retarding its progress." At that rate all I have to do is to turn the nozzle forward and try to drive the boat astern, and away she goes ahead, which was the very thing we were trying to do. I had not thought of that.

But, in simple fact, the whole operation is very different. When the jet from the pipe strikes the water its force is expended upon the mass of the water, which is practically a fixed body, and as action and reaction are equal, and the boat movable, the latter is driven forward on her course. She passes over the expelled air, but it is air at rest, for all its force has been expended upon the water and it simply *stops*. The difference in the friction of the boat against this air and the adjacent water will be in favor of the air, though it will be very slight.—Try again. There is abundant room for criticism, but it needs to come in a different line.

A.

Exhibition of American Machinery in Corea.

To the Editor of the Scientific American:

Your numerous readers will no doubt remember the late visit to Washington, New York, and Boston, of H. E. Min-Yong-Ik, the Corean Minister. He has just sailed from Marseilles, in the United States steamer Trenton, *via* Suez Canal, for his home in the far East, after a short visit to Paris and London, upon special invitation of our Government, through the courtesy of the President.

As the special envoy and representative of the Tah Chosun Government, and president of the agricultural department, his excellency takes a deep interest in the exhibition or museum being formed in Seoul, the capital of Corea.

In connection with this exhibition will be established an agricultural park for the practical display of the various descriptions of farming, mining, and geological implements, machinery, etc.

Before his departure from this country, the minister desired that I should take steps to make known to our manufacturers and business firms generally the desire of his government to have exhibits sent out, of such goods as may be adapted to the wants of an Oriental people, largely dependent upon agricultural and mechanical pursuits for their daily living. Up to the present time there has been no favorable opportunity of shipping to Shanghai and Corea by steam. The new American steamer San Pablo, to leave New York about the 25th of Feb. for Shanghai direct, *via* Suez Canal, offers a very favorable chance to intending shippers, both as regards time and reasonable rates of freight. The San Pablo should arrive at Shanghai about the 10th of May, and the goods should reach Corea about the 1st of June.

At Shanghai the steamers of the China Merchants' Steamship Company, leaving every few weeks direct for In-chun, the seaport of Seoul, will take these exhibits; and, as I am informed by the State Department, the freight charges from Shanghai to Seoul will be borne by the Corean Government.

All exhibits will be catalogued in English and Chinese, having the names of contributors or manufacturers attached. The Tah-Chosun Government should have the privilege of purchasing these exhibits, at the invoice prices, for purposes of early introduction among its own people.

My firm at Shanghai—Frazar & Company—will take charge of any goods, for transshipment to Corea, under instructions from shippers here.

On behalf of H. E. the Corean Minister, I shall be pleased to give any further information in my power that may be required, to assist in the opening up of the future trade between Corea and the United States.

Yours faithfully,

EVERETT FRAZAR.

73 South Street,
New York, Feb. 7, 1884.

Boiling of Oxygen.

In a paper presented to the French Academy, M. S. Wroblewski refers to his experiments in the liquefaction of oxygen, and attempts to make use thereof as a refrigerating agent. This he found to be exceedingly difficult, owing to the necessity of using the liquefied oxygen in closed vessels of great strength, and the very short duration of the ebullition. By means of a thermo-electric method the author was able to get an approximate measurement of the temperature at which liquefied oxygen boils when the pressure is suddenly released, which is stated to be —186° C., or 302·8° F. below zero. This is probably the lowest temperature ever recorded.

The author subjected nitrogen, after being compressed, to the action of this extraordinary cold. When the nitrogen was then allowed to expand a little, it solidified, and fell like snow in large crystals.

Chaperon and Lalande's New Battery.

In this form of single fluid battery, oxide of copper and metallic zinc are subjected to the action of a solution of caustic potash. Its construction is thus described in the *Polytechnisches Notizblatt:*

The oxide of copper is put in an open box of sheet iron which sits on the bottom of the glass jar, and to it is riveted a copper wire insulated with India rubber. This constitutes the positive pole of the battery. The negative pole consists of a half inch cylindrical bar of amalgamated zinc coiled into a spiral, and fastened to the lid so as to remain supended some distance above the box of oxide of copper. The upper portion of the zinc, where it rises to the lid, is covered with India rubber tubing, so that it may not be in contact with the liquid. The exciting fluid consists of a solution of 30 or 40 parts of caustic potash in 100 parts of water. Potash is preferred to soda, although the latter is cheaper, owing to the tendency of soda to effloresce. To prevent absorption of carbonic acid from the air, the jar must be provided with a close fitting lid or cover.

Among the advantages claimed are these, that the contact of the iron with the oxide of copper depolarizes the positive electrode. The reduced copper can be easily oxidized again by exposing it to damp air. If a current from a dynamo be passed through this battery in the opposite direction, the reduced copper will absorb oxygen, the dissolved zinc will be again reduced, and then regenerated. The new element is said to be very constant. One of these was used to ring a bell at the Vienna exhibition from beginning to end, with no other attention than the replacing of the evaporated water from time to time. A picture of the battery may be seen in the journal above referred to, in which the peculiar arrangement of the zinc pole is shown, but other forms will probably be found to answer as well.

Production of Iron and Steel.

The total production of pig iron in the United States in 1883 was 5,146,972 net tons against 5,178,122 net tons for the previous year. The past year was one of low prices, but not of greatly reduced production. The American Iron and Steel Association has received complete statistical reports from the companies owning the fifteen Bessemer steel works in operation in the United States in 1883, from which it is learned that the quantity of Bessemer steel ingots produced last year was 1,654,627 net tons against 1,696,450 tons in 1882. This is a much smaller decrease than has been generally supposed. It was, however, the first decrease that has occurred in the history of the Bessemer steel industry in this country. The quantity of Bessemer steel rails produced in 1883 by fourteen of the works referred to (the other company not producing rails) was 1,253,925 net tons against 1,334,349 tons produced in 1882, showing a decrease of 80,424 tons.

Great Britain's exports of iron and steel to the United States, in December last, show a falling off of 12,908 tons, as compared with similar exports in November. For the year 1883 there was a decrease of 506,929 tons as compared with similar exports to the United States in 1882, the exports being 688,187 tons for 1883 against 1,195,116 tons for 1882. Our imports of iron and steel in December were less than in any month since July, 1879.

Novel Thermometer.

The ordinary mercurial thermometer is, as is well known, based on the dilatation of bodies by the action of heat, and on the difference of dilatation between mercury and glass. A new thermometer, in which the mercury column sinks with a rise of temperature, has, moreover, been introduced by M. D. Latschinoff, who has based his instrument on the discovery of Kohlrausch that the coefficient of dilatation of ebonite is greater than that of mercury. Latschinoff has made the reservoir of his thermometer of ebonite, and the result is that the level of the mercury falls in it when the temperature rises, and, on the contrary, rises when the temperature falls. A rise of 20 degrees Cent. lowers the mercury 25 millimeters.

Micro-Organisms and Disease.

The public generally was not a little surprised when, something over two years ago, a German professor announced that he had made such progress in the microscopical examination and cultivation of different forms of bacilli and bacteria as to lead to the hope that thereby a means might be found of checking consumption, typhoid fever, and many other diseases, when established, or for their prevention, as small-pox is so largely preventable by vaccination. Since that time European savants have been yet more diligently following up this line of investigation; many different forms of micro-organisms have been successfully cultivated and made to assume widely different variations, so that one which was a virulent poison in one form, for a particular organization, might be innocuous to another, and *vice versa*. The end sought in these investigations is to so trace the immediate causes and propagators of all diseases as to materially aid in their prevention and cure, the theory being that inoculation with a mild type of micro-organism of a certain disease will overcome the more virulent, and thus prevent danger from that disease.

The knowledge thus obtained has thus far, also, been of almost incalculable benefit in the treatment of all diseases, especially those of a contagious nature. It was to enlarge our information in this field that distinguished French and German scientists visited Egypt during the cholera of last summer; freely endangering their lives in the prosecution of investigations in the hospitals and lazarettos of Cairo and Alexandria. It is greatly to be regretted, however, that American experts are contributing so little to this branch of the world's knowledge in this eminently humanitarian field, concerning which we quote as follows from the *Sanitary Engineer:*

"It is a shame that while these investigations are being pushed in Germany, France, and Great Britain nothing of the sort is going on in this country, the good commencement which was made in this direction by the National Board of Health having been totally abandoned for want of funds, while at the same time our legislative tinkers are at their wits' end to know what to do with the surplus in the treasury.

"Little by little the patient workers in European laboratories are tracing the life histories of the minute organisms which are found in the blood and tissues of men and animals affected with various diseases, and are learning to distinguish those which may be said to cause disease from those which only accompany or follow it.

"They have shown that a certain form of pneumonia is caused by an organism so minute that it appears only as a hardly perceptible dot or speck under the most powerful microscope, and yet which, nevertheless, they have cultivated in a series of tubes, and with the sixth or seventh culture have produced in animals pneumonia precisely like the case with which they started, showing that it breeds as true as wheat would do. Professor Quist, of Helsingfors, announces that the extremely minute particles of vaccine matter can be cultivated in the same way outside the living body and with the retention of their specific powers; and if this discovery be confirmed it solves the problem proposed by the Grocers' Company of London, who offered a large prize for the discovery of such a process.

"The last discovery of this kind is announced by Dr. Struck, of Berlin, who has been studying the micro-organism which appears to be the cause of a very fatal disease which sometimes affects the bones and marrow of man, and is known to surgeons as acute osteo-myelitis.

"The peculiarity of this organism is that it produces no apparent ill-effects when inoculated in animals, so long as the bones are sound. But if a bone in the animal is crushed or injured a few days before the inoculation is practiced, the injured limb is rapidly affected by the germ, and death follows in from ten to fifteen days.

"The fact that in order to produce this specific osteo-myelitis we must not only have the specific germ present, but must also have a certain damaged condition of the tissues, is a very suggestive one as indicating a possible explanation of the fact that in other specific diseases, such as diphtheria or typhoid, only a few out of many persons exposed to the specific cause may suffer any ill effects. The soil in which the seed is planted must be of the right kind and in proper condition, or the seed will not multiply. For some of the specific germs an inflamed tissue affords the most favorable conditions; as, for instance, in diphtheria, where a slight sore throat from ordinary causes appears to strongly predispose to an attack. Others, again, flourish in feeble and poorly nourished persons, whose blood is thinner and paler than in health, while still others appear to select as their favorite victims the ruddy and the strong, those who are apparently in blooming health, although such cases are exceptional. Those who have been breathing impure air laden with the emanations of cesspools, or of sewers of deposit, which are only another form of cesspools, or the air of overcrowded tenements, which contains almost as much foul organic matter as that of the cesspool, have been preparing in their own throats and lungs and blood a suitable medium for the growth, and reproduction in countless number, of these deadly little parasites.

"Much remains to be done in the study of the conditions under which these germs preserve their vitality and multiply outside the living body; in fact, we are only on the threshold of this part of the inquiry, and yet it is precisely this which is of the greatest interest to the health officer and sanitary engineer."

The Inventor of the Steam Plow.

The death is announced of the Rev. William Fisken, Presbyterian minister at Stamfordham, Northumberland, who was a septuagenarian, and had labored for thirty-seven years a few miles from Wylam, on the banks of the Tyne, where George Stephenson was born. Mr. Fisken, who was a native of Perthshire, while engaged in his religious labors, diligently pursued mechanics, in which his brothers, Thomas and David—of whom Thomas is a survivor—were equally proficient. Mr. Fisken was one of the two inventors of the steam plow, the other being his brother Thomas. Several years ago an important trial came off at Westminster upon the merits of the invention. The parties were the Messrs. Fisken and the Messrs. Fowler, the eminent implement makers at Leeds, and the finding of the jury was that the Presbyterian minister at Stamfordham and the schoolmaster at Stockton-upon-Tees were the original discoverers.

It is somewhat singular that the appliance which perfected the plan of the brothers, who had been working together at the steam plow, suggested itself to each of them independently and almost simultaneously. The late Mr. William Chartres, of Newcastle-upon-Tyne, the solicitor employed by the Fiskens, used to tell how the two brothers wrote to him on the same day about the final discovery, but that he received William's letter first.

Mr. Fisken also invented a potato-sowing machine, an apparatus for heating churches, and the "steam tackle," which has helped to render the steam plow of so much practical use. Mr. Fisken was much respected in Northumberland, in every part of which he was well known, both as an inventor and as an earnest minister of religion. His funeral was largely attended.

The First Steam Fire Engine.

A correspondent calls our attention to an article quoted in the SCIENTIFIC AMERICAN of January 26, page 49, from the Chicago *Herald*, under the above caption, in which the writer describes a visit to Mr. Greenwood's shop in Chicago in 1864, to see the new steam fire engine. Our correspondent thinks the article conveys the impression that this was the first steam fire engine made in the United States, which is incorrect, as he remembers to have seen steam fire engines on exhibition in the Crystal Palace, New York, in 1858.

Our correspondent is right; steam fire engines were shown at the Crystal Palace exhibition, and prior to that time trials of them had been made in this city. One of the early plans for a steam fire engine was illustrated in the SCIENTIFIC AMERICAN, Oct. 25, 1851.

We believe the first steam fire engine ever tried in this country was in New York. This was in 1842. It was a steamer built by the Matteawan Company for and on behalf of the insurance companies of this city, and was maintained by them for some time, doing good service at several fires whenever it was permitted to be used. But the firemen of New York were jealous of the new comer; they wrought themselves up to a bitter opposition; for if allowed to work it would distance all competitors, render hand engines of no account, and the occupation of "Mose" and the b'hoys would be gone. The insurance companies became satisfied that with hostility on the part of the firemen their losses would be increased rather than diminished, and the steamer was withdrawn.

"Floating" Oysters.

This is a term known among oyster packers as describing a way of making these bivalves look large and fat, although a close inspection will show that oysters so treated lack solidity and firmness, and are rather fluffy and bloated. The oysters are transferred from their native beds to tanks with different and a larger proportion of fresh water, and the operation became known as "floating" because, at first, the oysters were transferred from the vessels bringing them in to floats, which were towed to localities having the desired change of water, and there submerged. Oysters treated in this way are not only likely to lose their delicate flavor, but sometimes acquire a taste that is anything but desirable, which must have been the case in at least one instance in Chicago, where a dealer advertised that *he* did not sell "kerosene oil oysters."

Special Treatment for Different Woods.

The *Northwestern Lumberman* predicts that a portion of the furniture manufacturers will discover that their reputation is on the wane unless they treat more carefully the cheap woods used by them. Different woods require different treatment. . . . No one acquainted with the warping and shrinking qualities of wood, provided he had any desire to build up a lasting business, would place a wide piece of bastard sawed elm, with no material support back of it, in a piece of furniture, and this is being done every day. Maple and beech are used as injudiciously. The men who do it seem to think that such lumber will stand heat and change of temperature as well as walnut, which is a mistake unless it is properly sawed and seasoned, and then used in pieces of proper size. By and by the seasoning of wood by artificial means will become a science. It is constantly being proved that it will come to this. There are plenty of wood workers who talk long and loud about the "natural" process, and throw cold water on all others. In these days of discovery they might as well say that people should go naked because they were born so. The natural process has failed miserably, so far as it prepares certain kinds of lumber for certain purposes. The *Lumberman* is confident that in the near future elm, maple, beech, gum, and the other cheap woods will be used in high grade furniture, with no fear that they will perceptibly warp or shrink.

Professor Klinkerfues.

Professor Ernest Frederick William Klinkerfues, the German astronomer, shot himself in the observatory at Gottingen on the 28th ult. He was in his fifty-seventh year, having been born in Hofgeismar, March 29, 1827. He studied at the Polytechnic School at Cassel, and was employed as an engineer in the construction of the Main-Weser Railroad. He afterward devoted himself to the study of astronomy, and in 1851 was appointed assistant astronomer to Gauss at Gottingen, and succeeded him as Director of the Observatory, a position which he held to the time of his death. Professor Klinkerfues was the inventor of several astronomical instruments, principal among them being a new hygrometer for practical observations in meteorology. He was also the discoverer of several comets. He published a number of valuable articles in the review of the Scientific Society of Gottingen, and was the author of a work entitled "Theoretical Astronomy," published in 1872, and "The Theory of the Bilfilar Hygrometer," 1875.

TERRY'S AQUATIC TRICYCLE.

The accompanying engraving shows a novel tricycle invented by a Mr. Terry, of England, and capable of being converted into a boat.

When used on terra firma the apparatus is like an ordinary two wheeled velocipede with steering wheel behind (Fig. 1). The operation of converting it into a boat is very simple, and takes but half an hour.

The two large wheels are made in two parts, which are fastened together by bolts. Two sections, placed parallel with each other at a distance of a meter, are used to form a space for the rower to occupy. The other two sections, fixed vertically, and external to the first, serve to give length and to make a boat with rounded ends. Two steel tubes, which connect the small wheel with the body of the tricycle, serve to fix the two parallel sections at their upper parts and to hold them at a distance. A wooden rod which is of no use in locomotion on land, being passed beneath and in the center of the sections, keeps them in place and answers as a keel. The frame of the boat is completed by a cord, which, starting from the extremity of the upper part of one of the vertical sections, connects the extremities of all the rest with each other, and serves as a support for a tarred canvas that covers the whole boat with the exception of the central space reserved for the oarsman.

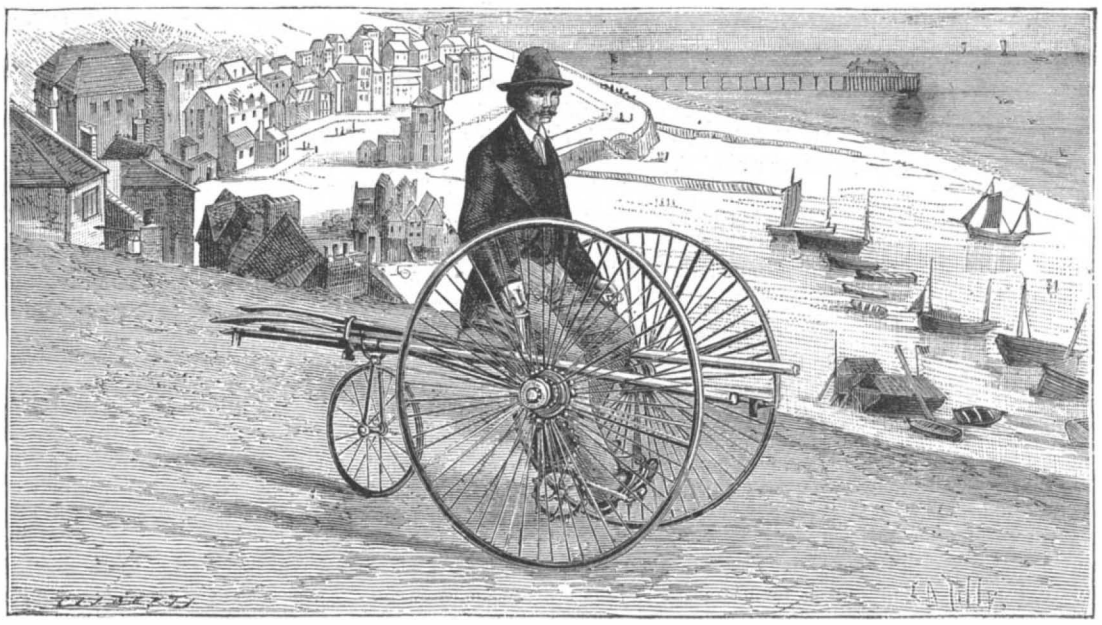


Fig. 1.—TERRY'S BOAT TRICYCLE.

All mounted, the apparatus forms a decked canoe 3·6 meters in length, 1·2 in breadth, and 0·6 in depth, that is to say, combining all the conditions necessary for proper buoyancy, even at sea (Fig. 2). The buoyancy is, moreover, increased by two air bags of 20 liters capacity each, which are attached to the two sides at the upper part of the open space. Mr. Terry started from London on his velocipede, Wednesday, July 25, at seven o'clock in the morning, and at 8 o'clock at night entered Canterbury after a journey of 58 miles. On the afternoon of the next day he was at Dover, a distance of fifteen miles only from the last named town. Friday he rested, and the next day, at nine o'clock in the morning, he left Dover in his tricycle converted into a boat. But three hours after his start the sea became rough, and it was not till five o'clock on Sunday morning that he touched land at Andreselles, a small village situated near Cape Gris-Nez. Having reckoned upon crossing the Channel in six or seven hours, he started without provisions; but, fortunately, Saturday evening he spoke a fishing boat from Boulogne, whose captain gave him cheer and pointed out the direction that he should take in order to land without danger.

The custom house officers, thinking they had a new sort of a smuggler to deal with, took him to Boulogne, where everything might be explained. Converting his boat into a tricycle he went from thence to Saint-Pierre-les-Calais, to the house of Mr. Maxton, a manufacturer of that town, to whom he had been recommended, and where he arrived Tuesday morning. Thursday, August 2, he started for Paris, and reached it after a journey of five days by the following route: Ardres, Saint-Omer Bethune, Saint-Pol, Doullens, Amiens, Montdidier, Clermont, Chantilly, and Saint-Denis. Distance, 290 kilometers. Mr. Terry, the inventor of this vehicle, is 29 years of age and has served for several years in the English navy.—*La Nature.*

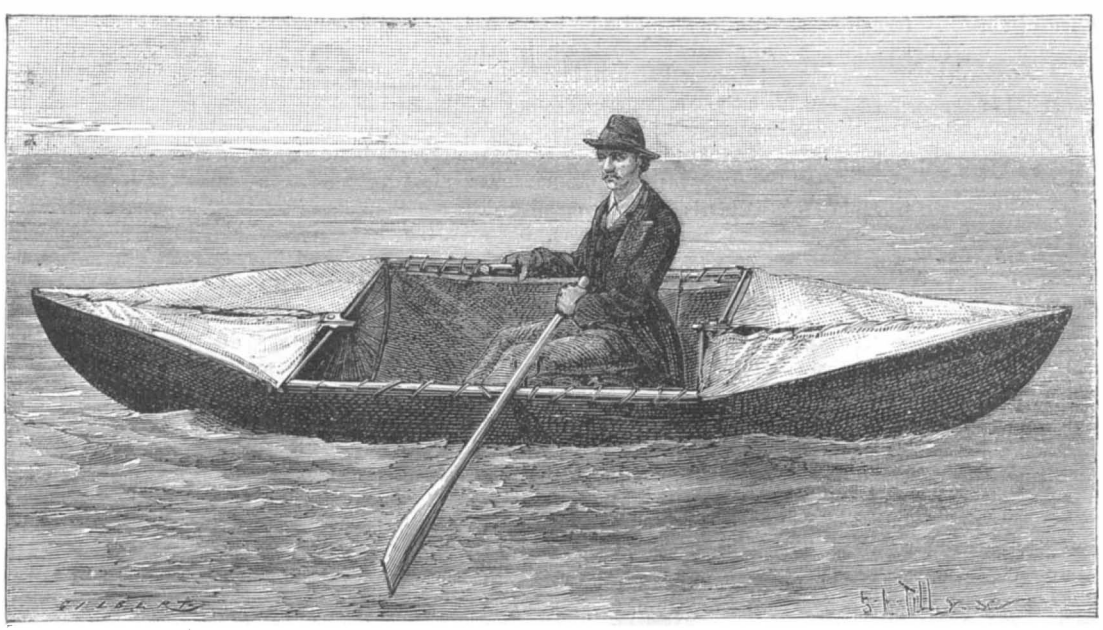


Fig. 2.—THE SAME CONVERTED INTO A BOAT.

Gas in Philadelphia.

Notwithstanding some abuses in the past in the public management of its own gas works by the city of Philadelphia, the report of the Trustees of the Gas Trust of that city for 1883, makes a very favorable exhibit. The price of gas was reduced, the city lighting was done free, except the cost of $7.35 per lamp for maintenance, the whole plant was greatly enlarged and improved—the mileage of gas mains now reaching 748 miles—and the wages of employes were increased, but the works made a net profit to the city during the year of $332,127. The accumulated profits from this source now amount to $4,871,085. The price of gas in Philadelphia is $2.15 per thousand feet against $2.25 per thousand in New York city. The Philadelphia people are supposed to get twice as much light from the same quantity of gas as the New Yorkers receive.

No wonder the stocks of our city gas companies command a high premium.

Feline Prescience.

I must give a fact which was communicated to me many years ago by an old physician, of which the good old man assured me he was an eye witness. In his house were two cats, each with a litter of kittens but a few days old. One of the cats was very young, it was her first litter, and the old cat was her mother. It was noticed that the younger cat did not seem well. Each one had her litter by herself, although both were in the same room. As the old cat lay suckling her own litter the young cat came to her mother and made a low mewing, then went to her own litter. The old cat followed her and immediately began removing the grand-kittens, adding them to her own. The truth was, she had adopted them, and seemingly at the request of their mother, for not many minutes more had elapsed before they were orphaned by their mother's death.—*S. Lockwood, Amer. Naturalist.*

PERIOPHTHALMUS.

In the swamps and brackish waters lying not far from the sea, in the torrid zone, especially in Western and Eastern Africa and in some of the islands of the Indian Sea, is found a species of fish called periophthalmus, which on account of the peculiar formation of their gills are able to live longer out of the water than other fish, and pass the greater part of the day in the wet mud. This fish is about fifteen centimeters long, of many changing colors and markings, but it has generally a light brown ground marked with silver and brown spots. A black band edged with white runs through the length of the upper half of the second dorsal fin; the other fins are also marked with spots and dots.

If any fish deserves the name of "tree climber" it is the periophthalmus, for its pectoral fins are constructed so that it is able to climb; they are rather feet than fins, and are used only as feet. These fish lie upon the mud, run along the shore like lizards, and rush upon their prey with such rapidity that they seldom fail in capturing it. If they are pursued they move swiftly over the mud, bore into it, and conceal themselves.

Pechuel-Loescne says that he has seen this strange fish only within the brackish water at the mouth of rivers or their branches, and never in the very salt lagoons. He has observed them at the mouth of the Kuilu on the coast of Loango. At low tide and in pleasant weather they may be seen by dozens, upon the flat, bare shore, generally on the brink in the shade of the mango trees. They avoid dry ground and ground grown over with grass and weeds. If they are not frightened they jump with a slight curving and stretching of the body, supporting themselves by their tail and fins. With short springs forward they make their way through the mud, leaving behind them a perceptible track, or they lie comfortably scattered upon the soft mud; then one attempts to leap, as if from excess of spirits, and sometimes a number of them jump about as if playing or chasing one another. It happens sometimes that a fish will suddenly spring from the ground upon a mango root, firmly clasping it with its fins. When frightened it will drop from the root. They can remain out of the water for hours.

They are moderately shy, and at the approach of any person raise themselves to an erect position by means of their fins. If one remains motionless and surprises them by coughing, whistling, or knocking, they will bend down and escape with quick leaps into the deep water, when they instantly disappear. These leaps are about twice or three times the length of the body. The native boys often shoot them with arrows, and lightly wounded fish will jump about a table in a lively manner. Their food consists of crawfish and insects.—*From Brehm's Animal Life.*

Effect of Gas on the Voice.

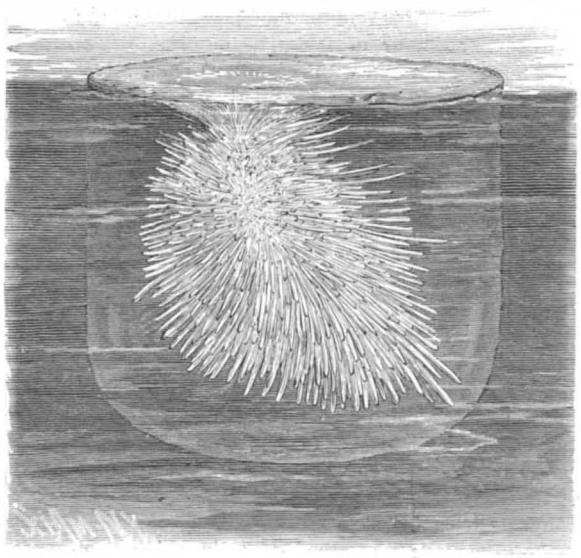
Our English exchanges inform us that Dr. Moffat delivered a lecture lately in Glasgow on voice training by chemical means. Dr. Moffat maintained that the presence of peroxide of hydrogen in the air and dew of Italy had some connection with the beauty of the Italian vocal tone. A series of illustrations by people taken from the audience, who inhaled a chemical compound made to represent Italian air, were largely satisfactory—a full, clear, rich, mellow tone being produced by one application. Several gentlemen present gave their favorable opinion of the new idea. Dr. Moffat's own illustrations were quite unique. Taking what was originally a voice of power and resonance, but destitute of intonation, he showed by chemical means this could become a tenor of great range. Some twenty notes, ranging from the lower to the higher register, were sung without any effort by the possessor of a voice of this character.

OIL OF WINTERGREEN AS AN ANTISEPTIC.—This oil, methyl salicylate, is obtained by the distillation of *Gualtheria procumbens*. It is here pronounced more efficacious than phenol, though it has the disadvantage of being more costly.

A CURIOUS CASE OF FREEZING.

Many of our readers will no doubt have had their attention called to the curious shapes which ice assumes under different conditions of freezing. Our engraving represents a form to which our attention was drawn a short while ago. It seems that a small cylinder shaped mustard bottle, partly filled with water, had accidentally been left out in the cold. In the morning it presented the appearance shown—in the center an oval nucleus of snow-ice from which thread-like air bubbles radiated in every direction. The experiment was repeated with different shaped vessels, and the same peculiarity was manifested in those with sloping sides.

The explanation of the phenomenon must be sought for



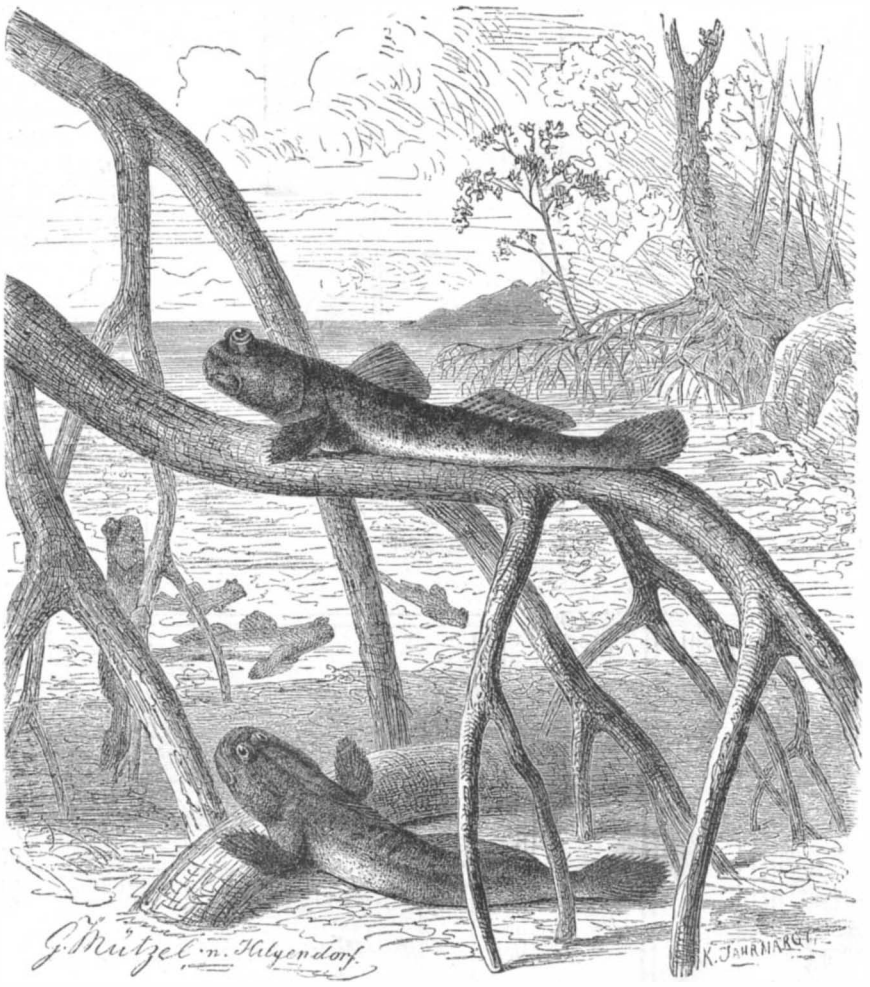
A CURIOUS CASE OF FREEZING

in the fact that ice is first formed on the outside surfaces of the water, thus imprisoning the air, which is separated from the water by the freezing of the ice. This air, as the freezing progresses, is forced toward the center, and since ice forms by shooting out crystals, the air is imprisoned between them, and presents the appearance shown. A specimen which had been thoroughly boiled to remove the air was frozen, but showed only very slight indications of this peculiar formation.

Amazons of the Insect World.

A lecture upon ants was recently delivered at Cooper Institute, this city, by the Rev. J. G. Wood. The geographical area of this wonderful creature is circumscribed; it is strictly a child of the South. In the tropics it is found in its full glory, but as it approaches the temperate zone it diminishes in size and interest until a point is reached where it disappears. Ants, bees, wasps, and hornets, which all belong to the same order of hymenoptera, may be divided into two grand sections—the solitary and the social. All that need be said of the former is that a male and a female pair off and make a rude nest with a few cells. All the interest and all the intellect may be said to be centered in the socials. "Here we have a queen, males or drones, and a multitude of smaller unwinged insects rightly called workers, which were once thought to be neuters in sex, but which are now known to be females whose growth has been arrested. They in fact resemble girls whose growth should be stopped at twelve years of age, and who should satisfy themselves with being housewives and nurses, without ever arriving at the dignity of motherhood. There can be no mistake about their sex, because they can sting and bite, and it is a certain fact that all wasps, hornets, bees, ants, and mosquitoes that either sting or bite are female. The male can do neither. The females do all the work and all the mischief, and show all the ingenuity. The males, in many cases, cannot even feed themselves.

"Among the workers there is an immense division of labor, which is not interchangeable. There are two great divisions, the warriors, or Amazons, and the civilians; and the former have become so accustomed to a purely warlike life of rapine and adventure that they cannot even feed themselves. Among some ants the workers are not of the same race, but are slaves captured by the Amazons, and it is a most singular fact that though they fight most stubbornly for their liberty, yet when once within the nest of their captors they become the tenderest of nurses and servants, feeding their mistresses, storing the eggs, looking after the grubs, tearing open their cocoons, storing up the honey dew, milking the ant cows, which are the green aphides that feed on the roses, and taking charge of the whole administration of the colony in the most disinterested and intelligent manner. They are never guarded, but though far more intellectual than their conquerors they never attempt to escape."



PERIOPHTHALMUS, OR LAND FISH.

The Young of the Lobster.

The early life-history of the lobster is most interesting. The eggs are, upon extrusion, found attached to the "swimmarets" of the abdomen (the so-called tail of the lobster), and constitutes what is generally known as the "berry." A single female lobster will have from 20,000 to 30,000 eggs—as nearly as possible the same as the female salmon. Attached in this "berry" form, the eggs remain for some three or four months, and then the young are hatched. "No nutritive or other than a purely mechanical relationship subsists all this time between the parent and its egg-clusters, the passing of its small brush-like claws among them to rid them of any extraneously derived substances, and the occasional fanning motion of its swimmarets to increase the stream of oxygenated water through and among the eggs, representing the sum total of attention they receive." The young animals that issue from the eggs of the lobster are distinct in every way from the adult. If, on the contrary, they were like their parents, they would at once sink to the bottom of the water in the immediate neighborhood of their birthplace, and the area of their distribution would be extremely limited. Nature here, however, as in the case of the great majority of marine invertebrate animals, has provided her offspring with special facilities for becoming distributed to long distances, their bodies being so lightly constructed that their specific gravity scarcely exceeds that of the fluid medium they inhabit, while they are additionally provided with long feather like locomotive organs, with which they swim at or near the surface of the water. As such essentially free-swimming animals, they now spend the entire first month or six weeks of their existence, in which time, it is scarcely necessary to state, they may be carried by the tides and currents many miles away from their places of birth. During this interval, however, the little lobsters by no means retain their primitive shape; their delicate skin, the rudiment of the future shell, is constantly getting too tight for them, and is thrown off to give place to a larger and looser one that differs each time in many structural points from its predecessor.—*Fisheries of the World.*

Effects of Rum on Pigs.

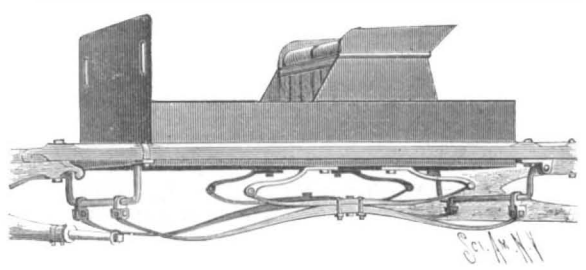
Mr. W. Mattieu Williams once witnessed a display of drunkenness among three hundred pigs, which had been given a barrel of spoiled elderberry wine all at once with their swill. "Their behavior," he says, "was intensely human, exhibiting all the usual manifestations of jolly good-fellowship, including that advanced stage where a group were rolling over each other and grunting affectionately in tones that were very distinctly impressive of swearing good-fellowship all around. Their reeling and staggering, and the expression of their features, all indicated that alcohol had the same effect on pigs as on men; that under its influence both stood precisely on the same zoological level."

Prompt Cure of Ringworm.

R. W. Taylor, M.D., in the *Journal of Cutaneous Diseases*, reports the best results from the use of a paint composed of a tincture of myrrh and four grains to the ounce of bichloride of mercury. Other skin affections are cured by the application of this remedy.

SIDE SPRING FOR VEHICLES.

The body of the vehicle is attached to jacks consisting of steel bars, serving to some extent as springs, and being jointed to the ends of short half elliptic springs, which are clipped at the center of their backs to the backs of longer similar springs, which have one end connected by shackles with a cranked bar suspended from under the front ends of the side bars. The other ends of the large springs are connected with a cranked bar suspended from the rear ends of the side bars in pivot bearings, thereby enabling the rod to swing sufficiently to accommodate the lengthening and shortening of the springs. The upper springs are connected to the others at about the same distance nearer the hind ends, as the weight of the riders is nearer these ends when seated in the carriage, thus permitting the springs to be more flexible in front than rear in the proportion that the load is lighter.



SHINNICK'S SIDE SPRING FOR VEHICLES.

This spring is applied to a rigid side bar frame without a reach. The strain on the upper sections of the springs is relieved, when forced down by the load, by the elastic action of the jacks, which work freely in the eyes by which they are connected to the springs. The lower sections of the springs, taking their share of the load, have free range for expansion and contraction by reason of the pivotal arrangement of the rear bar. The forward cranked bar, being rigidly connected to the side bars, makes less joints for wear and prevents the swing of the body forward and backward that would otherwise occur. The whole makes a spring that equally distributes the strains over all parts, thereby reducing the chances of fracture.

This invention has been patented by Mr. William Shinnick, of Shelbyville, Kentucky.

Quicksilver Mining in California.

The quicksilver industry on the Pacific Coast cannot be said to be in a flourishing condition. The long prevailing depression in prices has had the effect of closing down many producing mines, and only the larger ones can now afford to work, and they are not making much money for their owners.

There are altogether about 1,200 men directly employed in the quicksilver mines and furnaces of California, in addition to whom a large number are occupied as wood choppers, teamsters, etc., working on contract. The leading nationalities of the miners and furnace men may be stated in the following order: Mexicans, Cornishmen, Swedes, and Chinese, with comparatively few Americans. The Mexican miners, as in so many other instances, have developed a special fitness for this class of work, and their intelligence in finding ore amounts almost to an instinct. For the regular underground work of a mine, such as drilling, blasting, timbering, etc., the Cornishmen and Americans probably take the lead.

Miners at day work are paid from $2 to $3 per shift of ten hours, and on contract work from $2.50 to $3 per shift of eight hours. The wages of furnace men are $2 to $2.50 per shifts of ten or twelve hours. The New Idria mine gives employment to about 120 men. There the wages of white miners average $2.25 cents per day, the men boarding themselves. Blacksmiths and other mechanics and overseers are paid $4 per day. The Great Eastern mine employs 35 men, half of whom are Chinese. At this mine white miners are paid $2.50 per day, boarding themselves, and the Chinese, $1.25. The Napa Consolidated employs from 60 to 70 men at about the same wages. At the Sulphur Banks, when at work, 90 men are employed, and the same wages are paid as at the Great Eastern. In all these mines mechanics and foreman are paid from $3.50 to $4 per day. The Great Western gives work to 25 men; white miners are paid $1.25 per day and board; Mexicans $2.50 and $3 per day and board. At New Almaden, where a force of 500 men is kept at work, the average daily wages are $2.50.

An estimate has recently been made from the working results of different mines, showing that for every flask of quicksilver produced nine days' actual labor (calculated as if done by one man) is required. This, at the low average of $2 per day, would make the amount paid for labor $18 for every flask manufactured, or between 23 and 24 cents a pound. This, at present prices of quicksilver, does not allow much margin for profit after accounting for the other expenses, such as supplies, fuel, powder, flasks, steel, transportation, etc.—*Mining and Sci. Press.*

FILTERING CISTERNS.

BY G. D. HISCOX.

For the instruction of a large and increasing population that are more or less dependent upon cistern water for culinary purposes, and also in many parts of the United States or in foreign countries where there is nothing but rain water available for human thirst, we have prepared a few illustrations of the most approved forms and materials for filtering rain water that is stored in cisterns, especially for drinking and cooking purposes.

Among the things to consider in determining whether cistern water is safe to drink, are the cleanly or dirty condition of the roof, and the materials it is made of; whether leaves from overhanging trees fall upon the roof and lodge in the gutters; whether birds foul the roof; whether it is made of wood, slate, or tin, or of materials inimical to health—as lead, copper, or covered with deleterious paints.

The water taken from a cistern fed from a roof encumbered with leaves from an oak tree has been found so strongly impregnated with tannic acid as to turn water black when boiled in an iron pot.

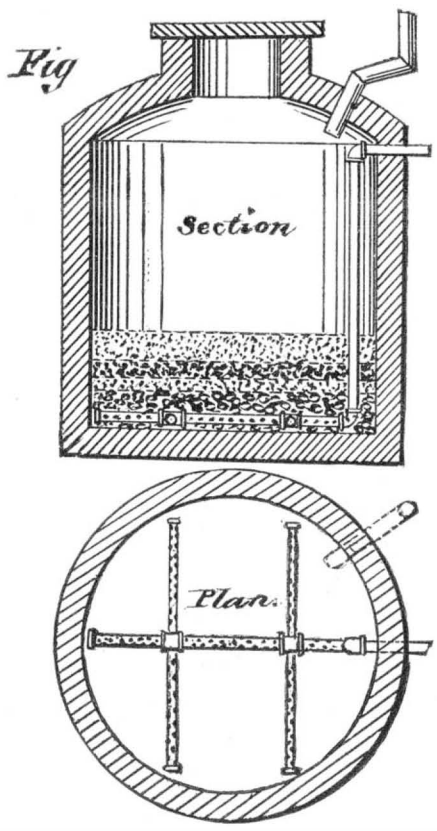
In order to obtain the best results from filtering cisterns, the roof and gutters should be kept free from leaves and dirt, and it is also advisable to arrange the leader with a switch valve, with the handle convenient for operating within the building, so that the first wash may carry away the dust, dirt, or other foul matter, and thus save only the best water.

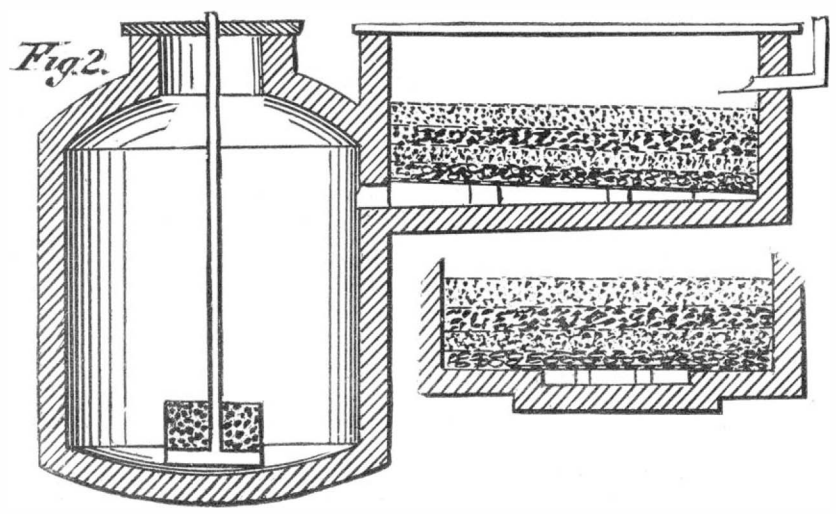
Caution should be exercised in locating cisterns that are intended to furnish drinking and potable water, that they be away from the influence of cesspools and privies, as clean water readily absorbs the odors, gases, and germs of foul air.

The materials selected for filter beds should be in accordance with the resources of the locality in which the filter is to be used, for the purpose of renewal.

We recommend such materials only as have proved reliable, leaving out all textile or organic substances, as we deem such unfit for this class of filtration.

Pulverized charcoal mixed with sand, or between layers of sand and gravel, so long used for filtering purposes, has a cleansing or antiseptic power, probably derived from the contact of a large carbon surface. Pulverized coke has been used, and is considered a fair filtrant, but less effective than charcoal. Bone charcoal has also been recommended as being highly antiseptic, besides having a strong absorbent power, due to the variety of its chemical components. It can be obtained from the dealers in New York.





Spongy iron, or pulverized hematite mixed with sawdust and roasted; pulverized magnetic iron ore and clean scales from a blacksmith's anvil, pulverized and mixed with clean, sharp sand, have been much used and experimented with in Europe with great success, in not only making fetid water sweet, but it is also claimed that the iron mixtures destroy bacteria and their germs.

A combination of the two extremes, a large carbon surface in charcoal and the pungent oxidizing qualities of the spongy iron, or its equivalents, will no doubt become the acme of a filter.

From experiments made with the filters of public water works in Europe, for the quantity of water that a filter will yield per square foot of surface, it has been ascertained that, with a filter composed of 10 parts fine, sharp sand, 1 part coarse sand, 15 parts spongy iron mixed with one-third its bulk of fine gravel, laid upon a strainer of perforated galvanized iron—a bed of brick laid close—or a stratum of gravel covering a perforated iron pipe, a yield of one gallon of clear, pure water for each foot in depth per hour for each square foot of surface; four feet being the greatest depth with a yield of four gallons per foot per hour—illustrating the probable fact that the velocity of the water corresponds with the depth of the filtering material for equal purity.

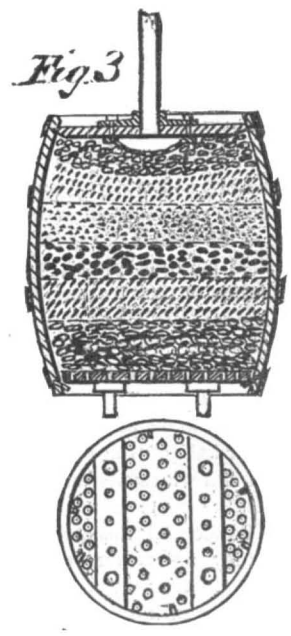


Figure 1 illustrates a method of preparing an ordinary house cistern for filtering. The pipe and fittings should be of galvanized iron; black or plain iron is better, as long as it lasts, as it rusts fast; in either case it is better to waste the water first drawn, for the water absorbs both the zinc and the iron when standing over night. The zinc is not healthy, and the taste of the iron is unpleasant.

The perforations should equal three or four times the area of the suction pipe, which in ordinary cisterns may be 1¼ inch pipe, while the branches may be ¾ inch pipe. The holes, if ⅛ inch, should number at least 200, distributed along the lower half of the pipes. Smaller holes are preferable; of $\frac{1}{16}$ inch holes 800 will be required.

For the filtering material we recommend a layer of fine gravel or pebbles for the bottom, 3 or 4 inches in depth, or heaped up over the perforated pipes; upon this a layer of sharp, clean sand, 9 inches in depth, upon this a stratum of pulverized charcoal, not dust, but granulated to size of peas or beans, or any of the material above mentioned, 4 inches deep; and upon this a stratum of fine, clean sand from 6 to 2 inches in depth, making a total depth of from 16 to 20 inches.

Such a filter should be cleaned at least twice in a year by pumping out all the water, taking out the mud or settlings, and one-half the depth of the top layer, and replacing with fresh sand.

The double filter cistern, Fig. 2, has much to recommend it, having a large receiving basin which in itself is a filter placed in a position for easy cleaning. The recess at the bottom may be covered with a perforated plate of galvanized sheet iron, upon which may be laid a filter bed of gravel, sand, charcoal, spongy iron, and sand in the proportions as stated above. This enables the frequent cleaning by removing the top layer of the filter bed without disturbing the water supply. The cover should fit tight enough to keep out insects and vermin.

A double bottomed basin perforated and filled with clear, sharp sand and charcoal should be attached to the bottom of the pump pipe as shown in Fig. 2.

This enables the small filter to be drawn up and cleaned, without the necessity of emptying the cistern or interrupting the water supply.

The half barrel or keg filter, as illustrated in Fig. 3, is a convenient form of cistern filter where filtered water is required from cisterns already filled.

This is also a convenient form for readily cleaning or changing the filter without the necessity of discharging the water from the cistern.

This filter can be made from an oak keg or half barrel, such as is used for liquors or beer. Take out one of the

heads and cut away the edge, so that it will just drive into the end of the keg; fasten two battens of oak across the head with oak pins left long enough to serve for legs for the filter to rest upon.

Bore this head full of holes one-quarter inch diameter. In the other head bore a hole 1¼ inches diameter, and bolt an iron flange into which the pump pipe is to be screwed. Let the bolts also fasten upon the inside a raised disk of galvanized sheet iron, perforated with a sharp point or chisel. Proceed to charge the filter by turning the top or flanged head down, and placing next the perforated plate a layer of fine gravel 3 inches thick, then a layer of sharp, clean sand 4 inches thick, then a layer of pulverized charcoal free from dust, 3 inches thick, then a layer of sharp, clean sand mixed with spongy iron, pulverized magnetic iron ore, or blacksmith's scales, followed by a layer of coarse sand, gravel, and broken stone, or hard burnt bricks broken into chips to fill up. Place the perforated bottom in as far as the head was originally; bore and drive a half dozen oak pegs around the chine to fasten the head. Then turn over the filter, screw the pump pipe into the flange, and let it down into the cistern.

Such a filter requires to be taken out and the filling renewed in from 6 to 12 months, depending upon the cleanliness of the water catch. With the precautions mentioned above in regard to the care of the roof, such a filter should do good work for one year.

Dr. Meldon's Electric Motor.

Electricity, both as a means of lighting and locomotion, has made, during the past few years, such vast strides in public favor that it is not surprising many discussions have been raised concerning it, or that the minds of the leading scientists have lately become engrossed with the study of so interesting a subject. Up to the present, however, owing to the enormous amount of electricity required to work even a medium sized dynamo, all attempts at electric propulsion—especially as regards boats—may be considered as purely experimental, its most ardent advocates being unable to claim for it any economical advantage over steam.

Many theories have been adduced toward, and several electricians have applied themselves to the task of, surmounting this difficulty; but it is to the intelligence and ingenuity of an eminent Irish physician that the scientific world is now indebted for the discovery of an important principle, which will, without doubt, be recognized in future in the construction of all magneto-electric machines. To Dr. Austin Meldon, of 15 Merrion Square, Dublin, belongs the credit of having designed a motor which not only does away with the manifold disadvantages and drawbacks attendant on the employment of dynamos, but also creates the largest amount of driving power with the least expenditure of electrical force.

Dr. Meldon, in his first attempt at motor construction, made use of twelve magnets, but when the machine was tested it was found that although each of the magnets would lift half a cwt., or attract a heavy iron bar from one inch, yet the whole twelve, when bound together, would only lift or attract exactly the same weight. Seeing that something was evidently wrong he sought information as to the cause of so singular a circumstance, but although he received a very large number of suggestions not one of his correspondents hit upon a solution. Nothing discouraged, Dr. Meldon persevered in his investigation, with the gratifying result that after some trouble he found that the inertness of the magnets was due to neutralization, and that by magnetically insulating the bars—about to be described—with copper instead of iron bolts, and putting a few layers of gutta-percha between the bars and the rims of the wheels, he could develop full power—a fact which seems to have been hitherto unknown.

The armature of the new machine is formed by joining together two 15 inch solid pulley wheels, with seven flat bars of iron, each bar being 24 inches long by 3 inches wide and 1½ inches thick, and, as has been observed, the bars are laid upon gutta-percha, copper bolts being used to fasten them to the wheels. A shaft of 1½ inch steel passes through the center, and the whole is supported by a hardwood frame, stayed with iron. Each side of the frame, where the shaft emerges therefrom, is supplied with an ivory commutator, the one on the right having three, and the other four brushes, each of which communicates with a magnet. Attached to the frame are seven electro magnets, the three larger ones being made of 2 inch soft iron, and wound with No. 14 wire, without bobbins, and the other four of 1½ inch iron and wound with No. 11 wire. The total weight, as at present constructed, is a little over 3 cwt.

The first trial of the motor took place in July last, in a boat 22 feet long and 5 feet beam, and the battery used on the occasion consisted of thirty-six cells of bichromate of calcium, with zincs 6 by 4 inches, and carbons 6 by 5 inches, the latter, as will be observed, *being larger than the former*. Half of the cells passed through a commutator into one set of magnets (the whole charge going into one magnet at a time), and the remainder of the cells, through the other commutator, into the second set. The great utility of this arrangement was experienced during the trip, as when all the cells were made use of the boat went at full speed, but when only one commutator was employed, half speed was obtained, and on a long trip the second battery could, of course, be recharged. The motor is capable of making about 900 revolutions a minute, but this in the trial trip was reduced to 400, when the boat went over, with a slack tide, 9 miles in a little more than one hour, a single mile having been accomplished in 7 minutes, and subsequently, when the tide was more favorable, 11 miles were gone over in an hour. A little over two horse power has been registered from only twenty-four cells; and here it may be remarked that Dr. Meldon, who takes an unusual interest in anything that relates to this science, has managed, by a very simple contrivance, to get over the difficulty hitherto experienced in keeping up a continuous light for many hours; that gentleman has had five Swan lamps in his house during the past two winters, and he makes his bichromate cells last twelve hours, by using large zincs and carbons, which at first are only immersed a short distance in the fluid, and then after two hours lowered a few inches more, and so on, using, of course, a larger number of cells than is absolutely required.

It is to be regretted that, owing to the small size of the launch, the battery, which was placed in the forward portion of the boat—eighteen cells being arranged on each side—occupied so much space that there was only room left for four persons to sit with any degree of comfort, and consequently he was obliged to abandon the idea of working his motor with a battery; but, judging by the actual results obtained, he is confident that with *two* storage cells of an accumulator he could easily obtain a speed of over 11 miles an hour.

The advantages claimed for the motor over a dynamo are: 1st. Only one-tenth of the battery power is required to obtain a single horse power. 2d. As there is no dead center it will start instantly, and there is, therefore, no loss of power. 3d. The whole force of the battery passes into one magnet at a time, so that very little power is required. It should be remembered that the launch Electricity had forty-five accumulators of the latest type on board, which were calculated to supply power for six hours at the rate of four horse power, the mean speed obtained having been 9 miles an hour. Dr. Meldon's had only thirty-six cells and did a mile in seven minutes, and it should be noted that the battery was nearly exhausted when this trial took place.—*Journal of Science.*

Sorghum Sugar in Massachusetts.

The practicability of growing sorghum for sugar making in Massachusetts was carefully tried last year by Mr. Henry B. Blackwell, and the value of the cane tested by Mr. S. P. Sharples, State Assayer, in nineteen different experiments, made at frequent intervals from August to the end of December. The season was an unfavorable one for growing sorghum, and this was also the case with sugar cane. Early Amber seed was planted, from Rio Grande, N. J., and from five to seven per cent of sugar and seven to nine per cent of sirup were obtained from the weight of the cane during a period of three months. Fifteen tons of cane were raised to the acre, yielding, by diffusion, over 4,500 pounds of sugar and sirup.

The yield of sugar was less before and after maturity, and in warm weather the cane deteriorated if not worked as soon as cut, though this did not make much difference later in the season, and one sample, cut October 15, and stored in a woodshed, yielded thirty-eight per cent of sirup, said to be "equal to the Porto Rico or New Orleans," at the end of December. These results, on the whole, seem to compare favorably with those obtained with the sugar cane at the South.

The yield of sugar on a 500 acre plantation in the parish of Ascension, La., is reported to average 3,600 pounds to the acre, but the planters this year are complaining bitterly of hard times, protesting against the Mexican and Hawaiian treaties to admit more raw sugars free of duty, and claiming that their industry would be utterly prostrated were it not for the present tariff.

Planters of sorghum for sugar making, therefore, while they may fairly count upon as good remuneration as they would be likely to obtain from other staple crops, if they heed the lessons of recent experience in this line, would be foolish to suppose that this new departure will at once prove a veritable bonanza to them, although, with intelligent and systematic effort, there is every promise of a steady increase in the production of sorghum sugar.

Spouting Oil Wells in Russia.

It is reported that on the 10th of September last a well was tapped at Baku, from which petroleum commenced to spout with a jet 300 feet high, at the rate of two million gallons daily. According to later official reports, the fountain was still flowing at the end of November; and the efforts of the owners to stop it had so far only resulted in checking the outflow to 1,000 tons of oil per day. During November another well at Baku, which has been giving a regular supply since 1874, suddenly commenced to "play," and threw up 500 tons of petroleum every 24 hours. The effect of this sudden outburst is disastrous to the district, pending arrangements for disposing of such a vast quantity of oil. Whole lakes of crude petroleum have been drained into the sea or set on fire, to get rid of the liquid, and the price of petroleum has sunk to 3½d. per ton on the spot.

The great local refining firm of Nobel Brothers have fourteen spouting wells capped over and idle, it being cheaper for them to buy oil than to use their own. This firm announce that by next spring they will be able to distill 75 million gallons of kerosene, and to transport 90 million gallons. As yet the Baku oil has only supplied the Russian, Austrian, and East German markets *via* the Volga; but a new line of railway just opened will convey the product to the southern European markets. It is believed that oil exists over 1,100 square miles of the Baku region, of which only a small area has been bored. The supply is regarded as inexhaustible, and is expected to keep down the value of petroleum oils and spirits in Europe, notwithstanding the condition of the American center of production.

The Artificial Formation of Minerals and Rocks.

Nearly all the interesting researches that have been made in forming minerals by artificial means are due to the chemists and mineralogists of France. Among these none are of more importance than those performed by Messrs. Fouque and Michel-Levy in the formation of various volcanic rocks and minerals through fusion. Recently they have collected their researches, heretofore scattered in several periodicals, in the form of an important volume entitled "Synthese des mineraux et des roches." They employed platinum crucibles incased in fire clay and kept at a high heat for several days, by means of a gas blast. By making use of the principle that minerals crystallize from the fluid magma in the inverse order of their fusibility, and by keeping the melted minerals at different temperatures, carefully chosen, a number of artificial products closely resembling natural minerals and rocks were produced. Thus from a fused mixture of anorthite and augite, plagioclase crystals were obtained by a white heat, kept up for forty-eight hours, and on a second heating at a lower temperature, augite crystals were formed, and the characteristic structure of an ophitic diabase was obtained.

Most of the basic basaltic rocks were thus artificially formed by one or more fusions of a mixture of minerals. The acidic rocks, or those containing quartz, orthoclase, muscovite, hornblende, etc., could not thus be produced. An amorphous or glassy mass was obtained, and the latter minerals would not crystallize out of a fused mass.

The interesting conclusion is therefore reached that granite, gneiss, and other acidic rocks, with their inclosed minerals, are not the result of igneous fusion. This is in accord with the generally accepted belief of geologists, derived from many considerations.—*Amer. Naturalist.*

Be Somebody.

Robert J. Burdette, the facetious editor of the Burlington *Hawkeye*, has been lecturing to large audiences in different parts of the country, and in his amusing style he imparts to the rising generation some wholesome advice. The following is from one of his lectures:

"Be somebody on your own account, my son, and don't try to get along on the reputation of your ancestors. Nobody knows and nobody cares who Adam's grandfather was, and there is not a man living who can tell the name of Brigham Young's mother-in-law." The lecturer urged upon his hearers the necessity of keeping up with the every day procession, and not pulling back in the harness. Hard work never was known to kill men; it was the fun that men had in the intervals that killed them. The fact was, most people had yet to learn what fun really was. A man might go to Europe and spend a million dollars, and then recall the fact that he had a great deal more fun at a picnic twenty years ago that cost him just 65 cents. The theory that the world owed every man a living was false. The world owed a man nothing. There was a living in the world for every man, however, provided the man was willing to work for it. If he did not work for it, somebody else would earn it, and the lazy man would "get left." There were greater opportunities for workers out West than in the Eastern cities, but men who went out West to grow up with the country must do their own growing. There is no browsing allowed in the vigorous West. An energetic man might go out into the far West, and in two or three years possess himself of a bigger house, a bigger yard, a bigger barn, and a bigger mortgage than he could obtain by ten years' work in the East. All young men ought to marry, and no young man should envy old men or rich men. In conclusion, Mr. Burdette said that a man should do well whatever he was given to do, and not despise drudgery.

A Novel System of Contracting.

The method of paying for the work and materials entering into the construction of the magnificent building now being erected by the Mutual Life Insurance Company on the site of the old Post Office, this city—described in our issue of October 20, 1883—is novel, and growing rapidly in favor for structures of this class. The architect, Mr. Charles W. Clinton, thus describes it to a *Tribune* reporter: "Each contractor renders every month a sworn statement of the cost of materials used by him and the amount paid by him for wages. To this is added a percentage, sometimes as low as 8 per cent of the whole, which is paid as contractor's commission. By this method we not only secure efficient work at lower than market rates, but we are enabled to change our plans and make such alterations as we wish in the course of construction, thereby getting rid of the frequent annoyances and disputes consequent on bills for extras."

Further than this, the plan here pursued insures the use of material at least equal in quality to that demanded by the specifications, and unless there be collusion between the contractor and seller, the bills represent the actual value of the materials. This system ought to be agreeable to the contractor, since he is relieved of risk and receives interest on the capital he invests.

ENGINEERING INVENTIONS.

An elevator has been patented by Mr. Geo. A. Saxer, of New Brighton, N. Y. By various combinations of devices in connection with the hoisting rope, including pawls, brakes, and safety wedges, the stopping appliances being moved independently of the car, a great degree of safety is obtained, and every facility afforded for managing the car.

A safety shell for blasting has been patented by Mr. George Freund, of Durango, Colo. This invention covers certain novel forms of construction, as improvements on invention patented by same inventor last year, the object being to obtain greater safety, not only in handling material, but in tamping the charge and connecting the fuse to the stick, candle, or other form of explosive material.

A bell ringing attachment for locomotives has been patented by Mr. Pennock M. Way, of Thurlow, Pa. The bell is suspended in the usual manner from a journaled yoke or shaft, and by suitable belt or gearing is connected with the running part of the locomotive, but so that this gearing may be thrown in and out very easily, thus enabling the bell to be rung automatically as desired.

A steam boiler or novel means of combustion of gases in the fire box before they pass to the boiler tubes, has been patented by Mr. John Alves, of Dunedin, New Zealand. A construction is provided for by which air passes under the grate bars and in the rear of the bridge wall, from the sides of which it is discharged over the fire, and also from a projection forward from the bridge walls into the center of the furnace.

A steam pumping engine has been patented by Mr. Edward G. Shortt, of Carthage, N. Y. It is direct-acting, with the pump piston and steam piston connected together and working in unison in a containing case, one end of which forms the pump, the other having valves and ports, and making an engine within the same case. This invention covers several features of improvement on a patent issued to the same inventor in 1881.

A furnace for treating ores continuously has been patented by Mr. Amedee M. G. Sebillot, of Paris, France. This invention covers an improvement on an ore furnace of the same inventor patented last year. In a tunnel-shaped furnace is a tunnel-shaped muffle, connected by flues with a receiver for the gas of the materials in the cars, which fit closely within the muffle, and are slowly moved therein by an endless chain in a gutter or trough in the bottom of the furnace, the chain having catches to take hold of projections from the bottoms of the cars.

MECHANICAL INVENTIONS.

An improved saw set has been patented by Mr. John S. Long, of Murphysborough, Ill. It is a novel construction and arrangement of parts, to be worked by the foot of the user, and so the hammer delivers upon the saw teeth a blow of uniform force, regulated with precision by a thumb screw; the blow may be made heavy or light, for thick or thin saws, but its force is adjusted as desired by the thumb screw.

A lifting jack has been patented by Mr. Benjamin F. Mansfield, of Centerville, Oregon. A toothed wheel is rigidly mounted on a screw spindle below the head, the wheel being held between the shanks of the forked end of a lever; two pawls are pivoted on opposite sides of this forked end, their inner ends being pressed outwardly by springs, so the outer ends engage with the teeth of the toothed wheel, the whole making it easy to rapidly raise and lower the screw.

An improved jack has been patented by Mr. Samuel J. Wisdom, of Montgomery, Ala. The object of the invention is to obtain a compact and powerful means of purchase for removing piston rods from the cross heads of steam engines, etc., for which is provided a cone-pointed screw, a nut in which it works, and means to take the wedge strain, by which great power can be applied without need of hammering or bruising the finished parts.

An improved loose collar attachment for hanging circular saws has been patented by Mr. William D. Sherman, of Grand Haven, Mich. By this means the lug or driving pins projecting from the fast collar of the arbor, and passing through holes in the saw and loose collar, are so connected as to relieve the lug pins of wear, strain, and breakage, and hold the loose collar as firmly as a fast one, while preventing irregularities or obstructions in the holes of the lug pins and saw.

AGRICULTURAL INVENTIONS.

A corn planter has been patented by Mr. Thomas Bell, of Shelby City, Ky. It is simple in construction, strong, light, and durable, will drop the corn at the required distances, and has an automatic marker indicating the position of the corn dropped, thereby making it easy to pass obstructions and plant the corn in straight rows.

A separator for grain has been patented by Mr. Frank L. Kidder, of Terre Haute, Ind. This invention provides for a separator formed of screws, with connected threads intermeshing but not in contact with each other, and mechanism to rotate the adjacent surfaces of each pair of screws in opposite directions, in combination with a suitably arranged box, supply tube, hopper, etc.

MISCELLANEOUS INVENTIONS.

A mail sack tag has been patented by Mr. George W. Dwenger, of Brooklyn, N. Y. It is formed of a rigid piece with a longitudinal beveled slot, a transverse slot, and a spring tongue, and can be easily and rapidly attached and detached from mail sacks or bags.

A toy target has been patented by Messrs. Arthur H. Hoffman and William F. Lloyd, of East New York, and Joseph H. Block, of Brooklyn, N. Y. It is a simple and amusing toy for children, combining toy cannon with different targets, figures, etc., and can be manufactured at small cost.

A skewer puller has been patented by Mr. Augustus F. Friend, of Gravesend, N. Y. It is intended to facilitate the withdrawal of skewers from cooked meats, and provides for handles pivoted to each other at their forward ends, where are jaws with their faces concaved.

A broom holder has been patented by Mr. Herman C. Berg, of College Point, N. Y. This is an exceedingly simple device, made of a single piece of wire, bent in such shape that it may be attached to the wall and will hold the broom in an inverted position by the whisk thereof.

A shading pencil has been patented by Mr. George B. Hecklinger, of Streator, Ill. It provides for a handle inclosing leads of different colors placed side by side, which permits of two or more such leads being used simultaneously, so that a mark shaded in different colors may be made at a single stroke.

A door and gate latch has been patented by Mr. Charles Wormuth, of Little Falls, N. Y. This invention covers improvements in latches with reversely-hooked ends to engage catches on door or gate frame and the wall, and, while simple, strong, and durable, can be used to hold a door or gate open or closed.

A butter cutter has been patented by Mr. Newton H. Sweet, of Stephentown Center, N. Y. It is an improved device for removing butter, lard, etc., from jars and tubs, in regular shaped cakes or blocks, which may be made of specified sizes; it may also be used as a butter trier, and that which is not required may be placed back in the tub.

A sole for rubber boots and shoes has been patented by Mr. Henry A. Wattson, of Granite, Colo. This invention covers the making of the soles and heels of rubber boots and shoes with metallic studs embedded in the solid body of the sole, thereby greatly increasing their resistance to wear, and in this way being especially desirable for miners' use.

A filter has been patented by Mr. Justin Durel, of New Orleans, La. This invention provides for filtering, under pressure of a force pump, such liquors as the cane juice or sirup of sugar plantations, so that the sediment and coarse matters will settle away from rather than be forced through the filter proper, and the filter can be easily cleaned.

An improved roller fixture has been patented by Mr. James H. Skidmore, of New York city. It is constructed with a bracket with an open bearing to receive a roller pivot, and with a fastener so the pivot will be kept from accidental displacement, to prevent shade, towel, and other rollers from getting out of their supporting brackets.

A checker and baseball combination game has been patented by Mr. Hiram S. Towner, of Dutton, Mich. The game board is divided after the manner of a checker board, with additional outside squares, and the game is played with two sets of stones of nine men in each set, designated by letters in the way players of baseball are put down in the score books.

An ash sifter has been patented by Mr. William T. Adams, of Baltimore, Md. This is a combination of a sieve, slanting shelf, and drawers, inclosed and arranged in a suitable box, whereby, when the refuse coal and ashes are dumped together, the box may be closed, the sifting done without dust, and the coal deposited in one receptacle and the ashes in another.

An improved tuyere has been patented by Mr. Enoch P. H. Martin, of Wilmington, Del. An annular space surrounds the central space through which cinders and ashes fall from the fire above, this space being protected from the cinders, and from thence air is distributed to the fire, so the fire will not clog, a better consumption will be effected, with economy of coal, and labor in cleaning out ashes is saved.

An apparatus for bottling and siruping aerated beverages has been patented by Messrs. James McEwen and Simeon Spencer, of Manchester, Eng. There is an aerated water cylinder, and valve operated by a cam or eccentric on a revolving shaft, an adjustable valve controls the sirup charge, there are revolving bottle carriers, and the operation is such as to allow the air to escape from the bottles being filled.

An unlocking attachment for time locks has been patented by Mr. Hiram P. Pruim, of Grand Haven, Mich. It provides for a weighted lever worked by the mechanism of the lock, and connected by a pawl and ratchet wheel with a train of gear wheels operating a rack bar with a trip arm to engage with the trip latch of a time lock, so the latch can be tripped by the continued movement of the combination lock mechanism.

A recording table or desk has been patented by Mr. Mathew S. Holt, of Weston, W. Va. This invention covers a novel construction whereby, with a supplemental leaf, a large book may be held with its right hand cover in line with the writer's arm, and if many leaves are turned over, the adjacent leaf may be lowered, to bring the surface of the page being written on in same plane with the top of the table.

A separator and conveyer has been patented by Mr. John S. Fairly, of Charleston, S. C. This invention covers a screw conveyer with flights in sections, armed at their outer edges with flexible or pliable material, and combined with a perforated trough or box, more especially designed for separating the kernels of cotton seed from the hulls after passing through the huller.

An improved pearl button has been patented by Mr. Henry Smith, of Newark, N. J. The object of this invention is to improve the construction of buttons for which a patent was issued to the same inventor last year, the tubular rivet being provided with transverse openings in its sides for the cross bar, and other changes made to insure a stronger and more durable button.

A sash holder has been patented by Mr. William A. McDonald, of Minneapolis, Minn. It is simple in construction and action, is entirely out of sight, permits the free raising and lowering of the sash, while holding it in the desired position, is durable, and prevents the sash, door, etc., from rattling by the wind. It consists of a novel construction in that class of fasteners where a friction roll is pressed by springs.

A polishing machine has been patented by Mr. Jean Pierron, of Elizabethport, N. J. The object of this invention is to furnish an improved machine for polishing wood, stone, and other materials, and to this end there are various devices whereby the position of the abrading wheel may be adjusted and its work definitely gauged, its disk being pressed on the material by a spring, and being easily removed when worn out.

A steam heated evaporator has been patented by Mr. Robert W. Turner, of Thornton, Tex. This invention is primarily designed to facilitate the reduction of cane juice to sirup, and covers a receptacle with a surrounding chest, both of which are contained in a vat, a steam coil surrounding the chest and steam pipe connecting with it as desired, and also a pipe for condensing vapor leading from the interior receptacle.

Changeable scenery for theaters forms the subject of a patent granted to Mr. Lafayette W. Seavey, of New York city. Each separate piece or portion is mounted on rollers arranged to rest upon the stage, so that all may be revolved in either direction. To bring a set scene into any desired position tie rods are built up in sections, and suitably connected, to serve as guides for the rotation of the scenes and as ties to hold the structure firmly together.

A sad iron has been patented by Mr. Alfred R. White, of Stevens Point, Wis. The ironing block or base is of approximately diamond shape, and from the center of its top projects a post, which has a spring catch for engaging a detachable handle, the latter preferably made in two parts; this handle can be adjusted in a lengthwise or crosswise position, to better adapt the iron for working on wide or narrow surfaces.

A fire escape has been patented by Mr. Robert Stevenson, of Ferrysburg, Mich. A balcony is devised for each floor of the building, the balustrade and floor of which fold up against the side wall under the windows, and are secured by catches, connected with a rod for releasing any one, when the floor falls on supporting brackets and the balustrade swings upright by springs, ladders being provided with the balconies to be let down by hooks.

A washing machine has been patented by Mr. Lars Christiansen, of Council Bluffs, Iowa. A suds box or tub has a series of brushes on the bottom, standing vertically, with another series fixed to the sides, while a hub standing in the center has brushes on its circumference, working in combination with a vertical shaft with radial arms, so portions of the clothes may be held between the cover and arms, and other portions rubbed against the stationary brushes.

A polisher and cleaner for metal and other surfaces has been patented by Mr. William Heard, of Paterson, N. J. It is more especially designed for cleaning and polishing cutlery in kitchen use, but used as a scrubber for floors, walls, etc. There is a container, and a percolator of cork, rubber, leather, or an equivalent, the container holding the polishing material, and the percolator being adapted to distribute the same over the surface to be polished or cleaned, as the polisher is passed backward and forward over it.

An apparatus for the application of compressed air to the manufacture of glass has been patented by Messrs. Adrien A. and Leon A. Appert, of Paris, France. It may be adapted to the goblet maker's chair at present used in crystal and glass works, so the blowing can be done mechanically there for all kinds of such work, and the escape and expansion of the compressed air can be utilized for the cooling of the glass, as well as other metal or moulds, thus facilitating the manufacture and saving moulds.

A barrel finishing machine has been patented by Mr. Robert O. Dobbin, of Waterloo, Ontario, Canada. This invention, while recognizing former patents in the same line, provides new and special mechanism for finishing barrels after they are set up in truss hoops. There are two rotating chucks and a stationary chuck with adjustable jaws, so a barrel may be centrally compressed until the end chucks are secured, when the jaws of the central chuck are radially withdrawn, and the barrel may be revolved. There are numerous special features, and while the machine can be adjusted to different sizes, one machine for each size is most economical, and all the hoops, heads, staves, etc., of one barrel will fit any other of the same kind, reducing the cost of both manufacturing and repairing.

An apparatus for the manufacture of carbon black has been patented by Mr. George G. Shoemaker, of Edenburg, Pa. This invention relates more particularly to making the black from crude petroleum and thick oil or sediment, also from the acid waste of refineries, the fuel being supplied under pressure to burners charged with asbestos or other incombustible material. Over the cup-like burners inclined cones are rotated, their apex upward, and over their upper surfaces cold water is distributed from perforations, so the flames strike cool portions of the cones, and the fumes are condensed, while steel scrapers extend up the opposite sides of the cones and detach the carbon black formed as the cones rotate, the black descending into a funnel and thence into a trough or tube for removal.

NEW BOOKS AND PUBLICATIONS.

OBSERVATIONS OF THE GREAT COMET OF 1882, MADE AT THE UNITED STATES NAVAL OBSERVATORY. Prepared by William C. Winlock, Assistant Astronomer. Government Printing Office, Washington.

This appendix to regular report of 1880 is valuable as affording a complete and chronologically arranged report of observations at the National Observatory from September 19, 1882, to April 4, 1883. The comet observed was the visitor whose nucleus presented so many changes and the whole of the comet such a wide variety of forms, which are well illustrated in the exquisitely beautiful plates here given. No theories respecting comets find place in this concise record, which embraces the observations of Prof. A. Hall, Commander W. T. Sampson, Prof. J. R. Eastman, and Prof. Edgar Frisby, U. S. N., and Assistant Astronomers A. N. Skinner and William C. Winlock.

Special.

REVIEW OF A GREAT AND BENEFICENT WORK.

Two recognized epochs of human life have been completed since we began this work. It is meet that we make a halt, long enough at least to take note of the region over which we have journeyed, and to examine the horizon which opens up to us.

Twice seven years ago one of us started single-handed to inaugurate and develop a new use, at once scientific and practical, professional and commercial, business-like and beneficent. They only who have tried it know the difficulties to be encountered in creating an entirely new business and securing its recognized entrance into the rank and file of business. That we have done this gives us the right to speak.

For eight years this single-handed work was prosecuted. The operator had a conviction that in the Compound Oxygen he had found a mode of redeeming his fellow-men from the sufferings of disease, more potent and benign than the world had ever seen. This inspired him with the courage to abandon a lucrative practice which he had been twelve years in building, and to overcome all obstacles in the way of realizing his dream—of proving to the world that his conviction was securely founded. That this has been fully accomplished, thousands of people—either cured or made richer in greatly improved health—stand ready to testify.

Sixteen years ago the senior partner had his attention called to a few persons who were taking the Compound Oxygen. They declared that they were improving with satisfaction. He felt sure that they were being *stimulated;* and that, consequently, they would soon show the effect of all stimulation, and retrograde below the point of health at which they began the treatment.

By carefully watching the cases for several months, his prediction failed of verification in a single case. He then induced several of his own patients—cases which any physician would have considered very doubtful under any system of medication—to try the effect of the Compound Oxygen. With surprise he watched them making commendable speed healthward. He then put members of his own family under treatment, and with like good results.

All this provoked a conflict in his mind. He had proof that in the Compound Oxygen there was an agent that would cure many sick ones whose condition would baffle the medical skill of any physicians whom he knew. And many others whom he might cure in six or twelve months would get well in as many weeks under the action of that agent.

Now the question forced itself upon his mind and peremptorily demanded an answer: "What are you going to do with this latter class of patients, who confide to your care the restoration of their health? As a faithful physician, is it not your duty to take the surest and shortest way to secure to them that for which they are paying you?" Well, what is the proposition? "Evidently, send such patients where you know they can be better served than they can be under your care and ministration." But that would be suicidal. "No, the proportion of such patients would be small." True, but the public will not discriminate. They will see only that the doctor sends his patients elsewhere to be cured, and, therefore, he lacks confidence in his own medical skill. "Well, there is one way out of the dilemma; get possession of the superior curative agent, and thus make peace with your professional conscience and prove yourself a friend to suffering humanity." What, and be jeered by one's friends, and tabooed by one's professional brethren! "That appears to be about the price. But what is the alternative?" Result: He gives up his hard-earned practice, secures at a great price the knowledge of and the right to administer the Compound Oxygen in this city.

This included only the Office Treatment in Philadelphia. Soon he was exercised by the fact that the operation of an office business was very limited. Something must be done to dispense the blessing far and wide. Accordingly, at no little expense, he hastened to make known to his professional brethren the virtues of Compound Oxygen, and to furnish them with outfits for administering it. As he ought to have known would be the case, his efforts excited ridicule and reproaches.

Nothing daunted, he entered upon a long series of experiments, which resulted in the conviction that there was a much better method of accomplishing the end in view than the one which had failed. Hence the widely known Home Treatment.

In this untried field he labored for a year; meeting many failures in his experiments, working hard at details, and creating a literature which the work absolutely required. On the last of June, ten years ago, the practicability of the enterprise was demonstrated. But he had exhausted his resources, broken his health, and almost sacrificed his life. The ship was built and launched, but three years' struggle proved to him that he could not freight and man it. Six and a half years ago he found a man who could appreciate the value of the work in hand. Our united forces have fulfilled the brightest hopes of the pioneer.

A new departure was the order of the day. The first and essential thing to be done was, to let those who needed our curative agent know that we were in possession of it. Knowing that many fortunes have been sunk in advertising, we decided to put that part of the business into the hands of one whose skill and experience had been proven. It is enough to say that the methods which he adopted have revolutionized important branches of advertising.

From the outset we have dealt truthfully with the suffering sick, realizing that *they* at least had a right to demand such dealing. We knew that we had a curative agent superior to any other in the world, and therefore the simple truth about it would be the best credentials it could have; hence we were not tempted to invent testimonials, nor to steal genuine ones, nor to romance on any.

The growth of the business has been phenomenal. During the first year the business doubled each month. During the last four years we have recorded in our books statements of diseases, reports of progress, repeated advice and prescriptions, of over twenty thousand persons. Much more could be said in proof of the success of our work as a commercial enterprise; but let this suffice. It is of much greater importance to prove that our professional success has exceeded the other.

What have we to show in this direction? During those fourteen years we have treated thirty thousand patients. Among these a large proportion had been sick for years. They had exhausted the skill of the best physicians of all schools, different sanitariums, various natural health resorts, shops of nostrum-mongers, and months of hygienic traveling. In many of these cases it has cost more to remove the baleful effects of the treatment practiced on them, than those of the original disease. How many of them have been *desperate* cases may be inferred from the fact that we have filled scores of orders—sent unconditionally—in which the patient had passed beyond the reach of any remedy on its arrival. And out of this un-

promising multitude, ninety per cent. have been either cured or greatly benefited.

We have proved that a number of diseases which by common consent have been assigned to the category of "*incurables*," no longer belong there. We have cured a number of cases of Bright's disease. Two of these cases were brothers whose father, one brother, and one sister had died of the same disease. We have treated four cases of *Locomotor ataxia*, or *progressive paralysis*. In all of these the progress of the disease has been arrested (which no system of medication has ever been known to do), and the patients have made genuine progress toward health. We almost never fail to cure asthma—even of fifteen years' standing—unless the case has been spoiled by the use of narcotics, which served as palliatives but constantly aggravated the disease. The same can be said of that "*opprobrium medendi*," hay fever. The cases of consumption—confirmed phthisis—which the Compound Oxygen has cured can be counted by scores. We are confident that we make more *genuine cures* of catarrh—nasal, laryngeal, bronchial, and pulmonary—than all the catarrh specialists in the country.

A distinguished member of the New York Bar, who appeared to be a wreck both physically and mentally, and who had settled up his worldly affairs, resumed his active business after three months' treatment; and this business he has successfully followed for a year. Mrs. Mary A. Livermore, who had been disabled for nearly two years by a dangerous exhaustion of the brain, has for a year and a half been prosecuting her professional work with more ease and energy than ever before. The Hon. W. D. Kelley, the Father of the National House of Representatives, will tell any one that he owes the last ten years of his life to Compound Oxygen; and it can hardly be disputed that during this period his labors have not been surpassed by those of any other member of Congress. William Penn Nixon, of the *Chicago Inter-Ocean*, says that he owes his life and some years of active usefulness to the virtues of Compound Oxygen. The public know very well the unqualified testimony which Mr. T. S. Arthur has borne in favor of the Compound Oxygen as exhibited in his own case.

But why multiply examples? We have published many hundred statements in the patients' own language of the effects of Compound Oxygen in almost every kind of disease.

Now what of the future? Having accomplished what we have, and against such odds, our progress henceforward should be broader, more successful, and more beneficent. As was to have been expected, proprietors of sanitariums and health resorts, whose business has been diverted from them by the popularity of the Compound Oxygen, try to show that our agent is inert. But until they can rationally account for the thousands of wonderful cures effected by it, their tirades are in vain. Of course there are—and there will probably be more—imitators of the Compound Oxygen. Some have already stolen our title, our literature, and even our testimonials. One of them, having obtained from William Penn Nixon an opinion of Compound Oxygen in his own case, now publishes it as though Mr. Nixon was cured by his treatment instead of ours! Some of those agents may be innocuous; but we have a good reason to believe that many of them are positively injurious. They will have their day.

But despite all factious opposition Compound Oxygen must become increasingly popular, so long as it possesses the ability to effect such remarkable cures as now attest its merit.

For full information regarding the treatment and its use, address Drs. STARKEY & PALEN, 1109 and 1111 Girard St., Philadelphia.

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.

Notes & Queries

HINTS TO CORRESPONDENTS.

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

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

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

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

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

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

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

(1) C. M. asks: In what proportion of bulk atmospheric air is reduced by compression into 2, 3, 4, etc., atmospheres? I mean, for instance, what room will 1 cubic foot of air occupy after having been compressed to 2, 3, 4, etc., atmospheres, showing a pressure of 45, 60, 75, 90, etc., lb. respectively? A. The pressure resulting from the compression of atmospheric air in volumes after cooling to the normal temperature is—volumes compressed into one—

2 vol.	4 vol.	6 vol.	8 vol.	10 vol.
15 lb.	30 lb.	45 lb.	60 lb.	90 lb., etc.

At the instant of compression the pressure arising from the liberation of the latent heat carries the pressure somewhat higher.

(2) H. M. B.—We should infer from the description that the substance was some sort of slag having a melting point lower than the heat to which the bricks were exposed. It is probably a silicate of lime or iron. To positively determine its nature an analysis would be necessary, the expense of which would be from $10 to $20, and a larger quantity of the coating would be required.

(3) J. L. T. writes that hammering and heating are two essentials to insure a good mill pick. Never strike a pick or any steel tool on edge where the red heat has left it; let all the hammering be on the flat surface, and the last blows right along the point of the tool to bring the steel close where the greatest resistance to the blow is required. Clean, cold, soft water with salt enough in it to float a common potato. Give the pick a cherry red heat, and dip without drawing temper; if the steel is good, you will have a pick that will give good service, and you can draw them down just as thin as you want them and give them from 1¼ in. to 1½ in. clear temper.

(4) F. W. M. writes: 1. Suppose I have a gear wheel with a loose journal-bearing surface 2 in. in width, revolving on a shaft 1½ inches in diameter, and another loose gear wheel just like the first, only that the width of its journal-bearing surface is half an inch, and it revolves on a shaft 6 inches in diameter. Will the bearing surface in both cases be the same, viz., 9·4248 + sq. in.? A. The bearing surface will be the same, 9·4248 + sq. in. 2. Now suppose the wheel on the 6 in. shaft is to be revolved only one-fourth as fast as the wheel on the 1½ in. shaft, would the friction and wear be same in each? A. The friction and wear on the small shaft will be about four times as great as on the larger. The contact surfaces in both instances are the same, but in the former case the same particles are brought in contact with one another four times while the other shaft is revolving once; and since the weight upon both shafts is assumed to be the same, the wear must be four times as rapid in the one instance as in the other. 3. Would it require any more power to operate one than the other? I have been thinking that under the above circumstances the wheel with the large shaft would suffer no more wear or friction, and take no more power, than the wheel with the smaller shaft. But if they were both to make a revolution in the same time, the former would wear four times as fast and take four times the power. A. It is impossible to answer the question of power positively, as the conditions are not fully enough given. We should say, however, that the power required to fulfill above conditions will be about the same for both shafts, although theoretically a little more power will be required to overcome greater wear of smaller shaft.

(5) O. F., Jersey City, asks what sized air chamber is required to sustain about 2,000 lb. dead weight in water? A. A chamber containing 32 cubic ft. of air is sufficient if made of wood.

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

S. P.—The sample consists of pyrite (iron sulphide). In order to determine whether it carried gold in paying quantities, an assay, costing $5.00, will be necessary.—C. B. S.—The specimen is decomposed limestone, of no value.

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To Ironmasters, Manufacturers, and Others.

The Government of New South Wales, being desirous of encouraging the development of the local Iron Mining and Iron and Steel Manufacturing Industries, are prepared to receive Tenders for the supply of 150,000 tons of Steel Rails, to be manufactured in the Colony.

Sealed Tenders marked outside "Tenders for the Manufacture and Supply of 150,000 Tons of Steel Rails" will be received at the office of the Agent-General of New South Wales, Westminster Chambers, Victoria Street, London, S. W., not later than the 30th November, 1884, and at the Public Works Office, Sydney, not later than the 10th February, 1885, at which latter place the whole of the Tenders will be opened at 11 o'clock, A.M., on the day last named.

Each Tender must be accompanied by a Bank Deposit Receipt to the credit of the Commissioner for Railways in the sum of (£1,000) one thousand pounds sterling, as a guarantee of good faith. Such deposit will be returned to the unsuccessful Tenderers as soon as the Tenders have been declared, but the deposit of the successful Tenderer will be retained as security for the due performance of the Contract. Tenders not accompanied by such deposit will be absolutely rejected as informal.

Printed copies of preliminary Specifications and Conditions of Contract may be obtained on application at the office of the Commissioner for Railways, Sydney, and also from Messrs. R. W. Cameron & Co., of New York.

Delivery of the rails is to commence not later than 1st December, 1886, and to be at the rate of not less than 15,000 tons per annum.

Contractors must give full information and particulars in their Tender as to the process of manufacture they intend to adopt, and also whether they will be prepared to manufacture and supply, at rates to be afterward agreed upon, such points, crossings, fishplates, and fastenings, etc., as may be required from time to time for the rails under this Contract.

Contractors must state in their Tender whether they intend to manufacture the rails from native materials only, or whether, and to what extent, they intend to use imported material, giving a separate price per ton in each case.

As it is unlikely that intending Contractors will enter into an engagement of the above nature, without first satisfying themselves by personal inspection as to the position and extent of the raw material in New South Wales required for the manufacture of iron, every facility and information on this subject will be afforded on application to the Under Secretary of the Mines Department, Sydney, or to Messrs. R. W. Cameron & Co., of New York, and free passes will be allowed on the Government Railways of New South Wales to representatives of Tenderers wishing to ascertain the resources of the Colony.

For the information of persons desiring to Tender, it may be stated that the official returns show that there were imported into New South Wales and Victoria (the two Colonies join each other, and are connected by Railway) within the last 10 years 1,250,000 tons of iron and steel inclusive of the permanent way material required for Government and other Railways constructed during the period mentioned. CHAS. A. GOODCHAP,
Commissioner for Railways.

Department of Public Works,
Railway Branch, Sydney, 1st October, 1883.

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