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NEW YORK, SATURDAY, DECEMBER 27, 1879.

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(Illustrated articles are marked with an asterisk.)

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THE SCIENTIFIC AMERICAN SUPPLEMENT

No. 208,

For the Week ending December 27, 1879.

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A YEAR'S PROGRESS.

During the twelve months now drawing to a close there have quietly happened not a few events which in times of slower progress, when great projects and great achievements were less a matter of daily occurrence, could scarcely have failed to make a grand stir in the world. There can be indeed no stronger proof of the exceptional character of the present time than our proneness to accept such things as matters of course. It is only when era-making events become common that they cease to be remarkable.

The regular readers of the SCIENTIFIC AMERICAN do not need to be told at this late day what important, if not memorable, occurrences in the world of progress—commercial, industrial, and scientific—have characterized the past year. Having followed from week to week this record of the world's most effective thought and action, they are already possessed of the grand results of the year's activities. It may not be unprofitable, however, before closing the history of the year, to recall to mind some of the more significant of its events, some of the more notable movements of progress it has developed.

It is safe to assume that the progress which has added most to our individual enjoyment, as well as to our national well-being, has been connected with the wonderful improvement in industrial and commercial affairs which the year has shown. The country was never more generally and earnestly at work than to-day, and was never working to better advantage. And, although in certain quarters an over-eager speculative spirit forbodes disaster to many, there is every reason to hope that the solid industries of the land will not be seriously infected, or seriously injured by the natural and inevitable consequences of speculative "booms."

Of purely scientific events it is hard to say which of the many important ones stand out most prominently; and the work of discriminating is made all the harder by the circumstance that the achievements first made known this year have largely been, as usual, the final outcomes of long series of patient labors; while the larger part of the year's work of our scientific men, in the field and in the laboratory, remains unreported.

Three or four new metals have been discovered; but that sort of thing has ceased to excite general interest. While one class of chemists has been thus adding to the list of elements, another class has been working with no slight promise of success to show that several if not all of the elements are but variant forms of one matter stuff. Meantime Mr. Crookes has been carrying forward his researches in connection with the ultra-gaseous state of matter, though apparently without making any discoveries of a radical character. Mr. Edison has made some valuable observations with regard to the behavior of highly heated metals in vacuo, and has materially improved the means of converting power into electricity. His electro-chemical telephone has been rapidly developed and practically applied; the sonometer has grown out of his induction balance, and the micro-telephone has been the basis of not a few more or less useful instruments of physical or physiological investigation. Mr. Edison's call for platinum for his long promised electric lamp has resulted in the discovery of many deposits of the metal in the West and elsewhere. A late dispatch from Colorado reports the discovery of the rare metal uranium in the Sacramento mining district. The ore is said to run 60 per cent; but the probable quantity of ore in the deposit is not mentioned. The development of the mines of gold and silver in the West during the year has been very rapid; and close at home we have the discovery in Westchester county, New York, of what promises to be of greater utility than any mine of gold or silver, namely, vast deposits of excellent emery. Another matter of local interest has been the addition made by the State surveyors to the accurate knowledge of the geography and topography of the central parts of New York. The work of geological and geographical exploration in the West has been pushed forward not a little during the past season; and the Canadian geological survey has done much good work. Further north the expedition in search of the remains of Sir John Franklin have made valuable corrections in the map of the region north of Hudson's Bay. On the opposite side of the continent the Jeannette has made a bold and promising push into the unexplored regions within the Arctic circle north of Behring's Strait. The safe passage of Nordenskjöld through the Siberian seas is the most notable event in northern exploration. Prejvalski and other Russian explorers have been doing good work in high Asia. Major Pinto has crossed the African continent; and a large number of exploring parties have pushed in various directions into the little known interior. The last report of importance mentions the discovery of the head springs of the Niger by a couple of Frenchmen.

In Australia, Forrest has made a bold and successful passage across regions hitherto unexplored, discovering vast tracts of farming and grazing lands where all was supposed to be desert.

In the field of engineering, a large number of important undertakings have been brought to successful issue, particularly in the construction of long and lofty railway bridges and great tunnels. Among the latter is the famous Sutro tunnel, and we are almost able to add the St. Gothard, which is rapidly approaching completion. The great work of improvement in the harbor of Genoa has been largely advanced; considerable good work has been done in the Hell Gate channel of New York harbor, and on the proposed tunnel under the Hudson. Several extensive ocean piers have been constructed at Long Branch and Coney Island. The mouth of the Mississippi has seen the practical completion of the opening of its channel to deep-draught shipping. A new Atlantic cable has been laid, and other works of the same character have been carried out in the Indian Ocean and elsewhere.

These are but a few of the topics of more than temporary interest which the readers of the SCIENTIFIC AMERICAN will recall. To speak of the important projects proposed, discussed, or actually begun during the year—like the proposed ship railway across the Isthmus of Panama, for example—would swell this article, already too long, beyond all reasonable limits. Besides, our readers do not need to be specially reminded of them. Enough appears at the hastiest glance to show that progressive men have not been asleep during the year, and that those who have cared to read about the world's real work have not lacked material for engaging their attention. This, not to speak of the hundreds of inventions described and figured in our pages; the numerous illustrated papers on our great industries; the illustrated papers on practical mechanics, and the many suggestions for inventive work that have been furnished from time to time.

STRENGTH, WEIGHT, AND FINENESS OF WOVEN FABRICS.

The last few years of particularly close competition in finding a market for all kinds of manufactured goods has rendered necessary very close attention to many little details which has before escaped notice, or were considered too trivial to be taken into account. It has been found, however, that these small items have often made the difference between a paying and a losing business, and, as is almost always the case, the closer study given to the practical working up of stock, in order to make these savings, has made possible a higher standard of excellence, and secured greater regularity and evenness in the production.

In the making of plain cotton cloths, as at present conducted in this country, we find an illustration of probably as great improvement in this direction as can be pointed out in almost any of our industries. It is but a few years since when all the yarn worked up was largely put in the goods by guess as to its weight and strength, or with very insufficient tests as to either point, and, although a certain number of threads to the inch was generally designed, this was not always obtained, while the weight of the fabric was largely only a question of average. To do business after this fashion now would be simply ruinous, even supposing that goods so made would meet the demands of buyers, who have been thoroughly educated on these points during the steadily falling values of all manufactured goods from 1873 to 1879. Now the yarn, almost from the time it ceases to be "roping," is tested as to its weight and strength, and, before it is ready to go to the loom, a very close standard must be obtained. This is secured by frequent trials for strength in a tester so nicely adjusted and so delicately balanced that it will determine the strain under which a thread will break even to the thousandth part of an ounce, and by scales which will show the slightest variations. The different qualities of cotton, of course, give varying results as to strength, but the fineness of the thread, the number of threads to the inch, and the weight of cotton to the yard (as also the amount of sizing or starch, which all our manufacturers use, though to a less extent than is done in England), must run exactly according to the specified quality and description of goods to be made. It is common enough for buyers to have little magnifying glasses, with the aid of which they can count the number of threads to the inch, but it is not so easy for them, after the goods are made, to determine the strength of the thread to a nicety, or tell how much of the weight has been added in sizing—at least, these are points about which very few of them trouble themselves much. The very low figures at which all kinds of cotton goods have sold for the past three or four years have caused the production of a much larger proportion of cheap goods than usual. Manufacturers have sought in every way to make something which would sell for a small price. Their efforts in this direction have given them a better gauge of the different points of superior or inferior goods than most of those who handle their products have yet attained. It is true, we have heard frequently how much better our goods are than some of those made in England, and how much more starch and sizing English manufacturers put in the finished cottons they export, and, as to a considerable proportion of the goods we make, we have no reason to doubt their superiority. It is equally true, however, that our manufacturers have nothing to learn from those in England in the way of cheapening their goods, and in making a poor article look like something a good deal better than it is. While we keep from sending such goods abroad we shall probably retain, and may even improve upon, the reputation we have already obtained, but our foreign competitors will be so exceedingly watchful that any progress we make will only be a success well earned. In the goods made for home consumption, however, it will be well for buyers not to take too trustingly anything offered them, on the broad ground that American cotton goods, because they are made here, are necessarily honest and well made. This used to be the rule a few years ago, but our manufacturers have now learned so well how to cheapen their goods that all those wishing to place low priced fabrics on the market, and such too as will look as well as those of higher cost—are thoroughly informed as to the manner of doing it.

ERASTUS BRIGHAM BIGELOW.

In the death of Erastus B. Bigelow, America loses another of the great inventors whose genius has so largely helped to raise her industrial prosperity to its present high position. Thirty-five years ago all carpets were woven on hand looms. The cost of labor in this country made it impossible for American carpet makers to compete in cheapness with the work turned out by the ill-paid hands of England and France; and even then, the high price of carpets made them rather an article of luxury than one of everyday use and convenience. In 1842 Mr. Bigelow, after making several useful though less important inventions, perfected a series of devices for making the carpet loom automatic, so that the costly labor of man might be displaced by the cheaper labor of women or boys.

After many unavailing efforts to induce carpet makers to undertake the manufacture by the new method, Mr. Bigelow succeeded in persuading the Lowell Manufacturing Company to make the experiment, and in 1845 the successful weaving of ingrain carpets by power was demonstrated. Subsequently Mr. Bigelow achieved the invention of power looms for the weaving of Jacquard Brussels, and Wilton carpets. To apply these inventions the inventor was compelled, in 1848, to set up a factory of his own. This establishment, at Clinton, Massachusetts, has grown to be the largest in the world for the manufacture of Brussels and Wilton carpeting, in which the several processes of worsted spinning, dyeing, and weaving are united in one concern. We may also set it down to the credit of Mr. Bigelow's inventions largely that the United States now leads the world in carpet production.

Mr. Bigelow was born in West Boylston, Mass., April, 1814, and died at his home in Boston, Saturday, Dec. 6.

REMARKABLE FLY WHEEL EXPLOSION.

On the night of December 5, 1879, the Rensselaer Iron Mill, at Troy, N. Y., was the scene of a most remarkable accident. The newspaper report says:

"It was about 10 o'clock, and the 200 workmen were busily engaged at their various tasks. Suddenly the large flywheel, 35 feet in diameter, and weighing 60 tons, exploded, it being separated into 10 pieces of about 6 tons each. Each of these pieces was hurled for some distance, several of them being forced through the roof. One passed through the air about 200 feet, and descended through the roof of a neighboring mill. Striking upon the iron floor, it bounded for a distance of 30 feet, settling within three feet of a nest of two boilers. Several workmen were about passing when the ponderous fragment entered, and their escape from death was narrow. James Wallace, a heater, was buried beneath a five ton piece of the wheel, and when extricated was still alive. He cannot recover, however, his skull being fractured, and he having been injured internally. In places the roof was completely destroyed. The damage will not fall short of $10,000. Work will be necessarily suspended for two weeks or more. The escape from a boiler explosion was exceedingly narrow, a piece of the bursted wheel, weighing six tons, falling between two of another nest of boilers, and destroying a portion of the brick work. Had the mass crashed through the boilers, the loss of life would have been large. Another fragment descended through the roof, breaking a steam pipe and burying itself through the floor at a spot where a workman had been standing not five seconds before. The wheel had been in use 11 years, often subjected to inspection, and the cause of its explosion is a mystery."

We trust that the causes of this extraordinary accident will be investigated by competent mechanical engineers, and the whole matter explained for the public benefit. We should be glad to receive full particulars with drawings for publication, if any of our friends can supply them.

A somewhat similar occurrence took place in this city in June, 1876, at the Kuntz Brewery, Third Avenue. In this case the fly wheel was only 9 feet in diameter, weight 3,600 lb. We gave at that time an extended report of the affair, with drawings, which showed beyond all question that the accident was due to carelessness and botching in the original fitting together of the wheel.

If there is any one part of a machine that requires more intelligence, skill, and minute care in its construction than another, it is the fly wheel. And after the wheel is put into use no other portion of an engine needs more frequent, careful inspection, and tapping, for the detection of flaws or the incipient loosening of parts, than the fly wheel. But we fear that both in the use and in the construction, carelessness is apt to be the rule and carefulness the exception.

THE SCIENTIFIC AMERICAN FOR 1880.

Like all the rest of American institutions, the SCIENTIFIC AMERICAN closes the year with the most assuring prospects of prosperity in the year to come. There never was a time when our patrons in the scientific and industrial world were more numerous or more successful in their undertakings, or had more solid grounds for looking back with satisfaction, or forward with confident expectation of increasing prosperity. The country has entered upon a period of successful activity which has made the past year profitable beyond precedent; and the coming years bid fair to surpass it in solid gains. Having taken possession of the vast and varied markets of our own land, our farmers, manufacturers, and merchants are reaching out to the earth's remotest ends, with every prospect of retaining and increasing their hold upon the world's most profitable trade.

From its intimate connection with all the great and growing material interests of the country the SCIENTIFIC AMERICAN cannot but share largely in the country's general prosperity; and the publishers are determined to make it more and more worthy of its position as the most popular scientific and industrial paper in the world. With a circulation of 50,000 copies every week, among the most intelligent and active men of the country, the men who are doing the country's best work and contributing most to its industrial and commercial activity, the SCIENTIFIC AMERICAN has a basis of permanent prosperity unrivaled among newspapers, and can offer to advertisers a medium for reaching customers unequaled in scope and directness. In addition, its monthly EXPORT EDITION, with a guaranteed circulation in all the principal cities and commercial centers in the world, is probably doing more to spread a knowledge of American pro ductive industry throughout the world than all other periodicals combined. An examination of any issue of our EXPORT EDITION will show how widely its advantages as an advertising medium are appreciated by our great manufacturers and merchants engaged in foreign trade.

With reference to matters more strictly personal, it may not be improper to say that the increasing favor with which the SCIENTIFIC AMERICAN is received by intelligent readers at home and abroad is the surest guarantee that the work it is doing is approved by its numerous friends.

As its circulation increases the possibility of adding to the scope and value of the matter it offers from week to week increases proportionally; and it is the purpose of its publishers not to slacken their efforts to make the paper increasingly worthy of its name and reputation. One great advantage of its widening circulation is the wider range of information it receives with regard to scientific discoveries, trade prospects, and commercial changes, from its friends in all parts of the world; and just here we may properly express our thanks for such communication from United States consuls, travelers, the heads of foreign business houses, and others, who have thus added materially to the interest and value of our pages. It is enough, in the way of promise for the future, to say that the coming volume of the SCIENTIFIC AMERICAN will not be inferior to those of the past, and will be as much better as experience, increasing facilities, and strenuous effort can make it.

Among a number of valuable and interesting subjects in hand for early issues, we may mention an article fully illustrating the central office system of telephonic communication, which is becoming so important a factor in modern social and business life. The illustrated articles on amateur mechanics, which have been so favorably received during the past year, will be continued; so, also, will the valuable series describing and illustrating our great manufacturing industries, and a larger share of attention will be given to practical mechanics and improvements in the various arts and other productive industries.

The SCIENTIFIC SUPPLEMENT will, as heretofore, give, in addition to many valuable original papers on scientific and mechanical subjects, a careful selection of all the more important discussions in the various departments of science and art made in all parts of the world. As hitherto the SCIENTIFIC AMERICAN will publish every week a full table of the contents of the SUPPLEMENT, so that those who are not subscribers to both papers may learn whether the SUPPLEMENT contains matter which is of especial interest and value to them.

THE FUTURE OF AFRICA.

What the eighteenth and nineteenth centuries have done for America the twentieth is likely to do for Africa. Civilization is attacking her ancient fastnesses from all sides. Europe is especially alive to the enormous capacities of the continent for trade. A score of more or less powerful missionary societies are bent upon the evangelization of its swarming millions; and with the facilities for rapid progress furnished by steam and electricity the speedy conquest of the interior by Christianity and the arts of peace is all but assured. Unlike the Americas, when first discovered, Africa is well peopled by nations for the most part well advanced in civilization, and ready to become important factors in the industrial and commercial world. They are far enough advanced to be large producers of many things that the industrial world has need of, and are equally well calculated to become large consumers of industrial products.

What with telegraphs along the coast, steamers and railways pushing inward along its ancient lines of traffic, the suppression of its external slave trade, the pluck and energy of scientific, missionary, and commercial explorers, and the great wealth of the national and international societies bent upon the early evangelizing of the African peoples and the commercial development of the enormous natural capacity of the country, we may reasonably expect in the near future an awakening in Africa as marvelous as anything the world has yet witnessed. Dark as its present condition is, Africa is a land of splendid possibilities.

It is not surprising, therefore, that commerce is studying its newly opened regions with keen interest; or that the ecclesiastical world is showing the liveliest concern for the future of regions which promise to be the seats of great Christian nations.

For a comprehensive, exact, and trustworthy survey of the real condition of this vast continent, its physical and ethnological characteristics, the recent work of its numerous explorers, the prospects of the various missionary enterprises on foot there, and the most suitable places for new undertakings, nothing could be more satisfactory than the paper read by the careful and learned recording secretary of the American Board of Christian Foreign Missions at the late meeting of the board of commissioners of the society at Syracuse. The paper is published in full in the current number of the SUPPLEMENT, in connection with an excellent map of Africa, embodying the results of all recent explorations.

STAMPS FOR TRADE MARKS.

In another column a correspondent proposes a method by which Congress might give protection to trade marks incidentally, under its power to levy and collect taxes.

Briefly stated, the plan is for the Bureau of Internal Revenue to make and issue to each manufacturer, who should want protection, a special stamp bearing his trade mark, as is now done in the case of patent medicines; these stamps to be sold nominally for revenue, but really for that protection to the manufacturer which might be provided under existing laws against the counterfeiting of revenue stamps. The tax thus levied would be uniform throughout the United States, thereby conforming to the requirements of the constitution; but the payment would be optional with those who desired its indirect protection.

The suggestion is a clever one, but open, we think, to several serious objections. The stamps would be expensive, even were the government to furnish them at cost. The labor of attaching them to each article to be protected would add another large item to the expensiveness of the proposed method. And still worse, it would be quite impossible to make the stamp permanent. The trade mark on a piece of chinaware, for example, would lose half its value if it could not be wrought into the material or imprinted upon its surface so as to stay. The same may be said of most lines of metal manufactures, woodenware, and so on. A stamp for revenue purposes, on the contrary, is intended to be quickly, surely, and easily destroyed. The existing system of State registration, imperfect as it is, would seem to be less troublesome, cheaper, and more efficient.

Henry Crawshay.

Not six months ago we had occasion to notice the death of Robert Crawshay, the great iron master of Merthyr Tydvil, Wales. About a year before, his brother, Francis Crawshay, died; and now we have to note the death of Henry, the last remaining son of William Crawshay, the great iron king of Cyfarthfa. A full account of the vast establishments built up by the elder Crawshay and his sons was given in this paper last June. When he died he left the whole of his valuable property in the Forest of Dean to Henry Crawshay, Cyfarthfa to Robert Crawshay, and Treforest and Hirwain to Francis Crawshay. From the time he came into possession of this property until the depression in the iron trade Henry Crawshay continued to increase and improve his inheritance, the total amount of ore worked between 1860 and 1870 reaching nearly 400,000 tons. At the time of his death he was preparing to enter extensively into the tin plate trade. He was the nearest likeness to his father among the three sons, and had all his father's perseverance and intuitive power. He was rugged in manner, but generous hearted, and won the hearty reliance of all by his unswerving probity. He died November 24, aged seventy-six.

Long Range Telephoning.

In a recent issue of this paper an exchange was credited with the statement that Mr. Robert Packer, "superintendent of the Pennsylvania Railroad," while traveling in Nebraska had conversed with his wife and friends at his home in Sayre, Pa., two thousand miles distant, by means of a telephone.

We now learn on good authority that, though Mr. Packer's friends received his communication by telephone, it was not so sent by Mr. Packer. The message was sent from Nebraska to Mauch Chunk, Pa., by telegraph; thence it was telegraphed to the Sayre office of the Pennsylvania Canal and Railroad Company (of which Mr. Packer is superintendent), and from there it was transmitted to Mr. Packer's house by telephone—falling short of the newspaper report of the telephone's performance by some nineteen hundred and ninety-nine miles and a fraction.

Our Sons Need Good Reading.

"I wish that my son had more of a taste for useful reading and study." Such is the lament one often hears from anxious fathers. To interest their children in things that are beneficial, thus to save them from bad company and pernicious habits, is the constant aim of every faithful parent. One excellent means to this end consists in making the SCIENTIFIC AMERICAN a regular visitor at your dwelling. Let it be in sight on your bookcase or table, and notice how quickly it attracts the young. Its pages are full of the most interesting, varied, and useful information, the study of which insensibly excites the mind with a desire for more; and this desire, once fairly kindled, endures through life, expanding and ennobling the intellect. A new volume of the SCIENTIFIC AMERICAN commences next week. Fathers, subscribe for your sons if not for yourselves.

Recognition of American Merit.

IN the Transactions of the Institute of Naval Architects, London, England, 1879, are the names of John A. Tobin, Engineer Corps, U. S. Navy, J. B. and N. G. Herreshoft, United States America, all of whom were elected members at the last meeting.

Mineral Oil and Electricity for Lighthouses.

The annual report of the Lighthouse Board says that the substitution of mineral oil as an illuminant has been made in many of the fourth, fifth, and sixth order lights. All of these orders of lights would have been supplied except for the fact that it is found that the oil deteriorated when placed in the ordinary large oil butts in use, and many small cans have had to be made, into which the supply of each station is placed. The great superiority of mineral oil as an illuminant over all other oils has induced the board to try the experiment of using it in the lightships. The oil used for this purpose is 300° of the flash test. It is thought that such oil, used in the Funck lamp, will much increase the usefulness of the lightships, and a great saving in the cost of oil will be made.

The board is desirous of making experiments to test the relative merits of the electric light and other illuminants. These experiments must be made in some lighthouse and on a sufficient scale to exhaust the subject. There are many machines for generating electricity, several of them of American invention, and the board wishes to test the principal ones. An appropriation of $50,000 is asked for the purpose of making these experiments.

An appropriation of $50,000 is asked for the construction of a first-class lightship, fitted with a powerful steam fog signal, to take the place of the lightship now off Sandy Hook, entrance to New York harbor. This is regarded as one of the most important light stations on our coast; and as an immense commerce flows past it, it should be marked by a vessel having all the modern improvements, to make it a more certain guide to the mariner. Should an appropriation be granted, the present lightship could be moved to a less important station.

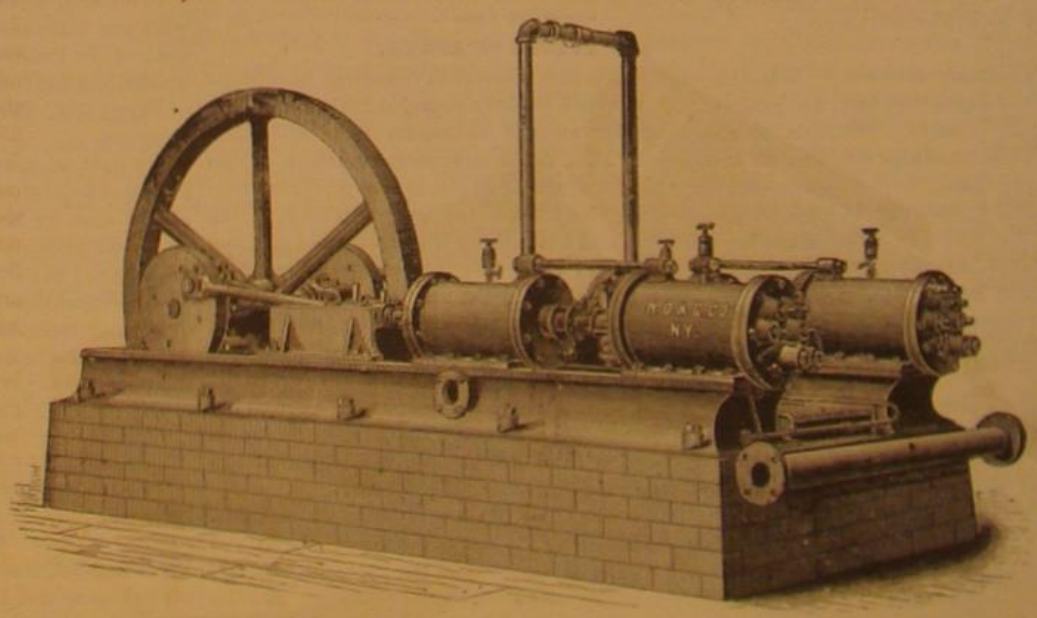
The Earth's Day Increasing.

In a recent lecture on "Eclipse Problems," Professor Charles A. Young, of Princeton, said, with reference to the observed increase in the rapidity of the moon's motion, that the discovery led at first to the opinion that the moon's orbit was growing shorter, and that ultimately the moon would come down upon us. More accurate calculation, however, shows that there is no danger of so disastrous a result. The moon is not coming nearer, but our day is growing longer, owing to the friction of the tides upon the earth's surface. The tides act like a brake, and slowly diminish the speed of the earth's rotation.

THE DUPLEX AIR COMPRESSOR.

Although compressed air cannot, under ordinary circumstances, compete with steam as a motive power, the machinery necessary to its use has been perfected to such a degree that it has been extensively applied to mining, quarrying, and engineering purposes, and it seems to be the only available motive agent for such uses. Compressed air as a motive power has been the subject of a great deal of practical investigation and experiment, and the losses arising from increase of temperature by the compression of the air and the cooling by expansion, also losses due to the resistance of the valves, and dead spaces at the ends of the compression cylinders, have all been reduced, if not avoided altogether.

The annexed engraving represents the duplex air compressor manufactured by the National Drill and Compressor Company, of 76 and 78 Center street, New York city. This machine, though quite plain in appearance, is of unusual strength and efficiency. We are informed that the performance of this engine is fully equal to that of the best engines in market. The dimensions of the compressor are as follows: Length of bed, 12 feet 6 inches; height of center of cylinders from floor, 18 inches; diameter of steam and air cylinders, 10 inches; stroke of pistons, 18 inches; length of connecting rod, 52 inches; diameter of wheel, 5 feet 6 inches; number of revolutions per minute, 133; cubic feet of free air compressed per minute, 436; weight of machine, 11,400 lb.



DUPLEX AIR COMPRESSOR.

Steam is admitted to the steam cylinders by a slide valve having an automatic cut-off. The air cylinders are lined with composition, and kept cool by water which passes spirally around the cylinder from the center toward the ends. By this arrangement the air cylinder is kept cool without having water in the cylinder. The air piston is adjustable, and travels to within one thirty-second of an inch of the cylinder heads. The induction and eduction valves are made so that they can be removed without disturbing other parts of the machine.

The National Drill and Compressor Company build single and duplex compressors of different sizes, which may be run by direct connection with steam engines, as in the engraving, and others which may be run by belts or gearing from the shafts of water wheels or other motors; they also make a variety of rock drills and mining machines which are in use and well known in all parts of this country, and are widely and favorably known in foreign countries.

A NEW TELEPHONE.

In the telephone shown in the annexed engraving the inventor has made use of Jamin laminated U-magnets to secure great magnetic power with little weight. The ends of the magnet are cut off diagonally, and the poles are each surrounded with a helix of fine insulated copper wire connected as in an electro-magnet. Two of these magnets are attached to an elliptical hoop, which surrounds the head and supports

NOVEL TELEPHONE.

the diaphragms and ear pieces. Each diaphragm carries a light triangular armature, which fits the poles of the magnets and nearly touches them. The telephones are connected with each other and with the line. The operation is similar to the Bell telephone. The instrument shown in the engraving is arranged as a receiver to be used with any of the ordinary transmitters, but it may be arranged as a transmitter.

Mr. Andrew C. Hubbard, of Danbury, Conn., is the inventor of this telephone.

A NOVEL system of insurance for girls has existed for several generations among the Danish nobility of Copenhagen. A nobleman, upon the birth of a daughter, enrolls her name with the insurance society, paying at the time a fee, and subsequently an annual sum, until she reaches twenty-one. She then becomes entitled to a fixed income from the society, and to apartments in the large building of the association, which is surrounded by gardens and a park. Should her father die in her childhood, she may immediately occupy the apartments. Should she die or marry, the income and the right to entail the home both lapse.

MEN of science, students, inventors, and every other class of persons desirous of keeping up with the times should become regular subscribers to this paper. They will find it a paying investment, for the SCIENTIFIC AMERICAN not only contains a record of all the important discoveries and inventions of this country, Great Britain, and other English speaking countries, but translations from the French, German, and other foreign scientific and industrial publications.

MISCELLANEOUS INVENTIONS.

Mr. Judson S. Corbin, of Clinton, Iowa, has patented an improved gate, which is so constructed that it may be opened and closed by the wheels of passing carriages. It is simple, convenient, reliable, and not liable to be obstructed or get out of order.

An improved water closet cistern has been patented by Mr. Hugh Houston, of Pittsburg, Pa. The object of this invention is to provide an improvement in that class of automatic overflow cisterns for water closets, whose discharge is so regulated, by means of an overflow compartment or chamber and float and valve connected therewith, that the discharge occurs at regular intervals, and each time gives the water closet bowl a sudden flush and thoroughly washes it out.

An improvement in letter boxes has been patented by Messrs. Wauhope Lynn, of New York, and Gottfried Clasen, of Brooklyn, N. Y. It consists in providing the box with a tube extending from the slit at the top inward and downward, and closing the lower end with spring doors having arms in position to be operated upon by a plunger connected with the hinged door covering the slit at the top on the outside, whereby, when the outer door is opened to put a letter in the box, the doors at the end of the tube are closed, thus cutting off communication through the tube with the interior of the box; but when the letter is slipped through the slit and the outer door allowed to close, the inner doors open and permit the letter to fall within the box.

Mr. Theodore L. Wiswell, of Olathe, Kan., has patented a combined buckle and trace carrier, consisting of a metal skeleton buckle frame having hooks located opposite each other, and having their ends bent inward, then forward and downward, to adapt them for holding the cockeyes of the traces securely when the latter are not in use, and yet permitting convenient detachment of the cockeyes when required.

An improvement in grooving irons has been patented by Mr. John W. Ammons, of Columbia, Mo. The object of this invention is to provide a plane iron which will chamfer off the outer corners of the groove simultaneously with the planing of the groove. It consists in a plate with beveled cutting edges combined with a grooving iron.

An improved swinging gate that is to be placed across a railroad track to keep cattle and other animals off, has been patented by Messrs. David A. Walker and John R. Smith, of Fort Benton, Montana Ter. It is to be opened by the contact of the pilot or cow catcher of the locomotive, and will close automatically immediately after the passage of the tram.

An improved combination tool, patented by Mr. Morgan H. Sly, of Shepardsville, Mich., combines several tools in one for the convenience of the mechanic, farmer, housekeeper, and others. It consists of a screwdriver, nail puller, wrench, nail hammer, wire cutter, riveting hammer, and pinchers combined in one tool.

An improved feed bag for horses, patented by Mr. Edwin Forbes, of Brooklyn, N. Y., has means for supporting feed bags in a convenient position for horses to eat from without interfering with the natural movements of the head. It consists in a spring arm adapted for connection upon the hames, with its outer end extending over the horse's head, and from which outer end the feed bag is suspended.

Mr. Patrick Gallagher, of Eureka, Nev., has patented an improved fire escape for attachment to buildings, which is so constructed that people can readily escape from the upper stories of burning buildings when the stairways may be rendered impassable by the fire.

Mr. Samuel H. Gregg, of Crawfordsville, Ind., has patented a fence panel formed of a long and short post, twisted wires, and hook headed bolts, arranged and applied in a novel way to form an inexpensive yet substantial fence.

An improvement in vises has been patented by Mr. Fortonato C. Zanetti, of Bryan, Texas. It consists in providing the clamping-jaws, which are secured to the lower end of the fixed jaws of the vise, with a spherical socket and adjusting-screw, to adapt the said jaws to embrace a ball on a standard attached to the bench, to form a ball-and-socket connection between the vise and bench.

Mr. Joseph Seiler, of Norwalk, Conn., has patented an improved device for connecting the mirror standards or supports with a bureau, in such a way that they can be easily attached and detached.

Mr. Charles F. Harvey, of Van Buren, Ark., has invented an improved attachment for the dashboard of wagons, and other vehicles drawn by horses, for holding the reins. It consists of an adjustable frame attached to the dashboard, supporting a horizontal bar, composed of two parts, the upper part being divided so that the reins can be slipped down between the two parts.

Mr. Samuel V. Kennedy, of New Haven, Conn., has patented a device for removing the metallic primer from an exploded cartridge shell, for applying a new primer, and for closing the shell tightly about the ball after it has been reloaded.

An improved implement for browning coffee, popping corn, and roasting peanuts has been patented by Mr. Stephen M. Poff, of Omaha, Neb. It consists in a pan made with a close top, having a hole in its top closed with a close cover having a perforated slide, three ribs or flanges upon the bottom, and a handle attached to the rear end.

An improvement in gates has been patented by Mr. Alonzo O. Dean, of Bethel, Vt. It consists in a gate post with an iron socket sunk into the ground and braced by extending arms; the gate is hung on rollers pivoted in a frame attached to the post, and provided with a ratchet bar which engages a toothed wheel connected with a helical spring. When the gate is opened the spring is wound up, and retracts when it closes the gate.

Mr. Philip W. Cassil, of New Athens, O., has patented an improved weather strip for doors. The invention consists in the combination with a main strip and the cap strip of bent straps engaging with hooks or staples, and serving to hinge the strip eccentrically to the door.

THE CLIMAX SAFETY HAMMERLESS GUN.

There can be very little doubt now that it is only a matter of time when the hammerless gun, or gun with internal

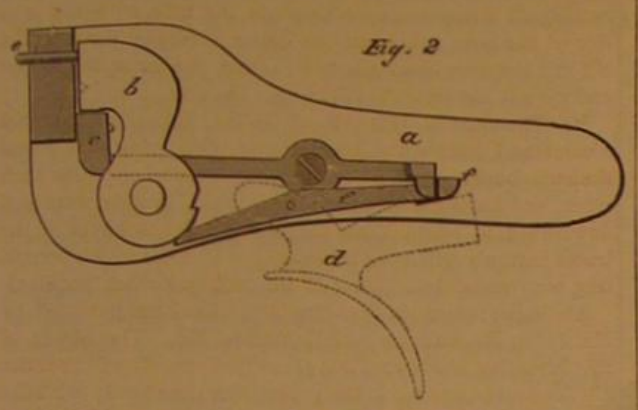


Fig. 2

hammers, will entirely, or almost entirely, supersede the ordinary gun with external hammers. The doubt with regard to hammerless guns has been whether they were as safe to use and as free from accidental discharge as the old style; and this doubt has had some foundation, for many of the hammerless guns are made with a locking bar which secures the triggers only, and allows the hammers to be jarred off and charge exploded when the locks have become worn or light in the pull off.

With the Climax hammerless gun such an accident appears absolutely impossible, for not only are the triggers bolted automatically, but, as may be seen by reference to the engraving, there is a strong block, *c*, which rises in the front of the hammers, *b*, as the gun is opened, which block interposes between the hammers and the strikers, *e*, and thus prevents any chance of the former reaching the striker, and thus exploding the cap. This block, *c*, is operated upon by the trigger, *d*, the pulling of which removes the block, and allows the gun to be fired. So that not only is the gun secure when the triggers are bolted, but even when the gun is placed at full cock ready for firing. No jar or fall can explode the gun, for should the locks be jarred down, the hammers would simply fall upon the safety block instead of upon the strikers.

Too much importance cannot be given to this principle of making a gun secure from accidental discharge when placed at full cock. Probably more than half the accidents that occur with guns occur through some blow or fall, causing the hammers to fall and thus fire the cartridge.

The principle of the Climax hammerless is also particularly well adapted for rifles of various kinds, there being no hammer to catch into anything when deer stalking or pushing through thick brushwood.

The breech fastening of this gun has not only the double grip bolt under the barrels, but also a very powerful grip formed by the top lever engaging a projection at the end of the rib. The lock is made upon the principle of an ordinary side lock, and is so arranged that the locks can be taken off like the locks of an ordinary gun. The rods which force the locks to full cock are completely under cover, so that there is no chance of water reaching the lock work. In this gun the jar given when firing heavy charges from one barrel cannot fire off the other barrel. This is an advantage which will be appreciated by sportsmen who have used large rifles with heavy charges. Fig. 1 in the engraving shows the exterior of the breech and the locks. Fig. 2 shows the internal construction of the lock, and Fig. 3 shows the hammer, *b*, cocked, and the safety block, *c*, in position.


Fig 1

HOLLAND'S CLIMAX SAFETY HAMMERLESS GUN.

These superb guns are manufactured by Messrs. Holland & Holland, 98 New Bond street, London, England, a description of whose fine workmanship we gave an account in a recent number of the SCIENTIFIC AMERICAN.

The Life of Railways and Rolling Stock.

The report of the Illinois Railroad Commissioners contains the following data concerning the average life of the rolling stock and superstructures of twenty-six roads: Locomotives, 15¼ years; passenger cars, 15¾ years; stock cars, 10 years; freight cars, 11½ years; iron rails, 7 years; steel rails, 14 years; oak ties, 7 years; pine ties, 4¾ years; cedar ties, 5½ years; truss bridges, 9½ years; trestle bridges, 8 years; pile bridges, 9 years; joints and fastenings, 7 years; fencing, 8½ years. One road gives the life of its locomotives as 8 years, and of passenger cars 15; another road reports the former at 24 years, and the latter at 20. Only one road puts the life of passenger cars as high as 20 years, and the lowest reported life rate of such cars is 8 years. The shortest life of iron rails is 3 years, and the longest 12; four roads report it as 10 years. Only four roads report the life of steel rails, and they give it as 9, 12, 15, and 20 years respectively. These data differ considerably from those of roads in other sections of the country.

Alizarin Blue.

G. Auerbach recently read a paper on this subject before the Chemical Society, London. He states: About eighteen months since a blue coloring matter was brought into the market as a substitute for indigo. It is now disused on account of its high price and its unstable nature when exposed to sunlight. The researches contained in this paper were finished in May, 1878. The author gives a résumé of previous work on the subject, and recommends the following method of preparation: 1 part of dry mono-nitro-alizarin, 5 parts concentrated sulphuric acid, and 1½ parts of glycerine (sp. gr. 1·262), are mixed and heated gently. Reaction commences at 107° C., becomes violent, the temperature rising to 200°. Much frothing takes place, with evolution of sulphurous acid and acrolein. The whole mass, when frothing has subsided, is poured into water, boiled up and filtered, the residue being boiled out three or four times with dilute sulphuric acid.

The mixed filtrates are allowed to cool, and the blue separates in brown crystals. These are purified by mixing with water and adding borax till the solution becomes brownish violet, the blue with the boric acid forming an insoluble compound. This residue is washed, decomposed with an acid, and the pure blue obtained as a violet silky paste. If required perfectly pure, it must be crystallized successively from its various solvents, high boiling naphtha, amylic alcohol, and glacial acetic acid. When pure it forms brown shining needles, melting 268-270°. It has the formula $C_{17}H_{11}NO_4$. Salts were prepared and analyzed, but the results were not satisfactory, as it was difficult to obtain them quite pure. Bromine derivatives were also prepared and examined. The action of chlorine, zinc dust, acetic anhydride, etc., have also been studied. The author discusses the constitution of the blue, and thinks it must be closely related to the aldehydines discovered by Ladenburg, which are formed when aromatic orthodiamides act upon aldehyds.

Ammonia on Brass.

John Y. McLellan, of Glasgow, writes to the *Chemical News* as follows:

While experimenting on the action of liquor ammonia on various metals and alloys, with a view to determine the most suitable for the contraction of a certain part in an ammonia plant, I have met with a reaction on brass which, so far as I know, has not before been recorded and of which this note is a preliminary notice. If a small piece of brass or a few brass turnings be covered with liquor ammonia, sp. gr. 0·880, in a closely fitting stoppered bottle, and placed aside for a few days, it will be found that the ammonia has acted on the copper of the brass to such an extent as to produce a solution of a more or less characteristic violet color, due to the presence of oxide of copper held in solution by ammonia. If this solution be still allowed to remain undisturbed for a few days longer free from contact with the air, this violet color will gradually disappear, leaving a colorless solution, which, however, is no sooner brought into contact with the air by removing the stopper than the violet color is reproduced, and by again stopping the bottle and leaving it aside the same reaction occurs and may be reproduced over and over again.

The production of the violet color from a colorless solution on exposure to the air does not seem to be the result of oxidation, as on opening the bottle in an atmosphere of carbonic acid the same reaction takes place.

I am at present working up this subject in the hope of finding in what state this colorless solution of copper exists.

Household Perils.

Under this head the Boston *Journal of Chemistry* names several dangerous substances which find their way into households. There are two or three volatile liquids used in families which are particularly dangerous, and must be employed, if at all, with special care. Benzine, ether, and strong ammonia constitute this class of agents. The two first named liquids are employed in cleansing gloves and other wearing apparel, and in removing oil stains from carpets, curtains, etc. The liquids are highly volatile, and flash into vapor so soon as the cork of the vial containing them is removed. Their vapors are very combustible, and will inflame at long distances from ignited candles or gas flames, and consequently they should never be used in the evening when the house is lighted. Explosions of a very dangerous nature will occur if the vapor of these liquids is permitted to escape into room in considerable quantity. In view of the great hazard of handling these liquids, cautious housekeepers will not allow

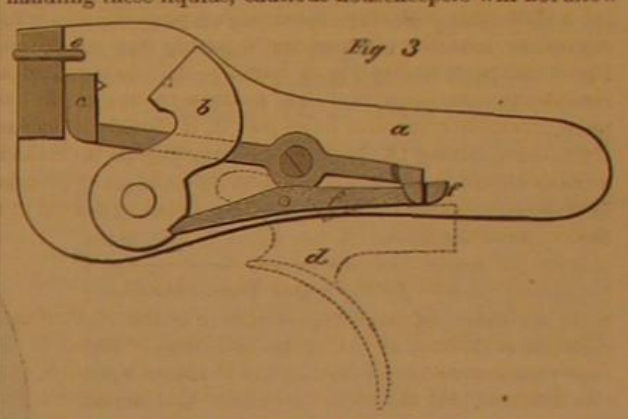


Fig 3

them to be brought into their dwellings, and this course is commendable.

As regards ammonia, or water of ammonia, it is a very powerful agent, especially the stronger kinds sold by druggists. An accident in its use has recently come under our notice, in which a young lady lost her life from taking a few drops through mistake. Breathing the gas under certain circumstances causes serious harm to the lungs and membranes of the mouth and nose. It is an agent much used at the present time for cleansing purposes, and it is unobjectionable if proper care is used in its employment. The vials holding it should be kept apart from others containing medicines, etc., and rubber stoppers to the vials should be used.

Oxalic acid is considerably employed in families for cleaning brass and copper utensils. This substance is highly poisonous, and must be kept and used with great caution. In crystalline structure it closely resembles sulphate of magnesia or Epsom salts, and therefore frequent mistakes are made and lives lost. Every agent which goes into families among inexperienced persons should be kept in a safe place, and labeled properly and used with care.

Congress of American Potters.

The sixth annual convention of the Potters' Association of the United States began in Cincinnati, Ohio, December 2. About a hundred manufacturers were present, representing all the prominent centers of the industry. The secretary reported that the past year had been an eventful one in the history of the ceramic art in this country. Never before had more rapid advances been made in any department of industry. Additions and improvements have been made to nearly every pottery in the United States. Several new ones have been built, and others are soon to be erected. Each manufacturer has seemed determined to succeed, and, bending all his energies to that end, the result has been a success far surpassing the most sanguine anticipations. With increased knowledge has come increased power, and the result may be seen in the quality and beauty of our productions, which are rapidly taking rank with the best products of other lands, and the old prejudice against American ware is now nearly a thing of the past. Especially in the decorative department has the improvement been marked. The demand for this class of goods has rapidly increased, and American artists have succeeded in producing results never before accomplished in this country. Some of the lady artists of Cincinnati are fast gaining a national reputation for their beautiful work. We need in this country more art schools. The success of our industrial and commercial interests depends largely upon this. A cultivation of taste and a love of art would create a demand for wares of higher artistic order, and thus build up an industry which might in time rival the most beautiful productions of Europe. This holds good not only in the ceramic, but every department of industrial art.

FIVE SUNDAYS IN FEBRUARY.—It is interesting to note that in February next there will be five Sundays. This occurs but three times in a century.

AGRICULTURAL INVENTIONS.

Mr. Reuben Graves, of Hope Town (Lostant P. O.), La Salle County, Ill., has invented an improved jointer for plows, which is so constructed that it may be adjusted to throw its furrow slice forward or sidewise or rearward. It may be leveled however its standard may be attached to the plow beam, and it may be adjusted to cut its furrow slice loose from the ground.

An improvement in grain planters has been patented by Mr. John W. Rykard, of Abbeville, S. C. The object of this invention is to furnish a simple, inexpensive, and effective seed planter or dropper for attachment to a plow, to be operated by the plowman.

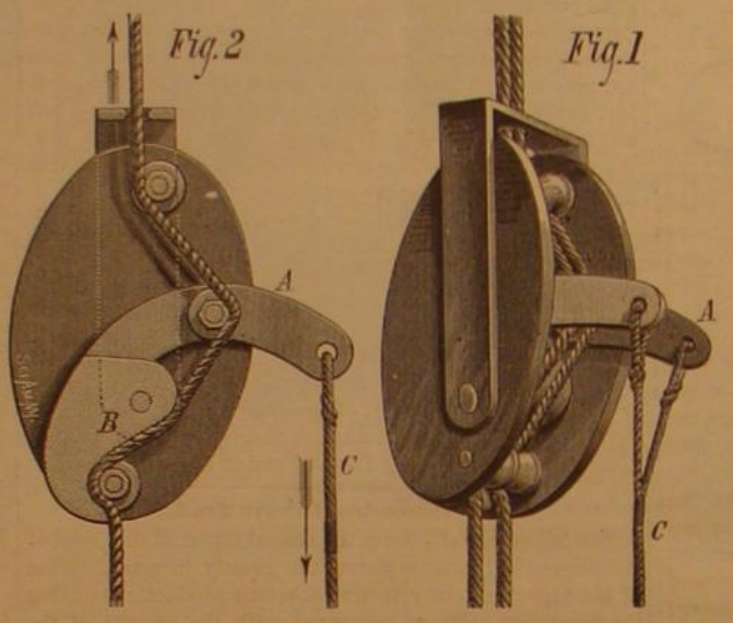
Mr. William W. Sauls, of Denison, Texas, has patented an improvement in cotton choppers, which consists in combining a chopper with mechanism for operating it, and a brake and hand lever. In order that this machine may work properly it is necessary that the seed should be planted or drilled in a straight line. To insure this the inventor has constructed a planting attachment for the machine.

BOAT-LOWERING AND DETACHING APPARATUS.

The engraving represents an automatic brake for tackle used in lowering ships' boats, and for other purposes requiring a self-acting brake for controlling running ropes. The engraving shows the apparatus in perspective in Fig. 1 and in section in Fig. 2. The brake is operated by the strain of the rope to which it is applied.

The curved lever, A, is pivoted on the pin, B, in a frame resembling that of a pulley block. A sheave, having one or more grooves, according to the number of ropes employed, is journaled in the lower part of the frame, and the curved lever carries a hexagonal roller. In the upper part of the frame there is a sheave of small diameter, over which the rope passes on its way out of the apparatus. The rope passes over the upper and lower sheave upon one side, and over the roller carried by the lever on the opposite side, so that any strain on the rope tends to move the lever so that its lower end acts as a brake on the rope passing over the lower sheave. The device is supported by the external stirrup, and the pressure of the lever upon the rope is lessened by pulling on the rope attached to its outer end.

The apparatus is the invention of Mr. William A. Brice, of Paris, France.



BRICE'S BOAT-LOWERING APPARATUS.

Steam on Pennsylvania Canals.

For several years efforts have been making to find an acceptable substitute for mules in hauling coal barges on the Pennsylvania canals. A new attempt will be made next spring. A steam canal boat is now in course of construction, to be put on the Lehigh and Delaware canal between Mauch Chunk and this city. The craft is to be entirely of iron, except the cross beams and deck. It will be eighty-eight feet in length, ten feet seven inches in breadth, and will be propelled by a ten-horse power steam engine with a screw wheel. It is said that, by a new invention to be applied to the screw, there will be but little agitation to the waters, and the washing out of the banks will consequently be avoided. The boat will have a carrying capacity of 105 tons of coal when drawing five feet of water. If it works satisfactorily a number of them will be constructed.

Tobacco.

BY T. B. SPALDING, M.D., OF TROY, ILL.*

In a recent essay before this society, I considered the action of alcohol within the human system, and on this occasion I am pleased to respond to your courteous invitation with observations on the action of tobacco. These agents might be profitably presented as almost identical in action, and shown to be largely accessory to each other's sins, but the *temperance* is waived for the *physiological* phase of the argument.

Of tobacco's origin, its introduction, its composition, its cost, the extent of its consumption, and the processes of its preparation, I purposely pass, to deal more directly with it in its physiological relations to the functions and forces of human life.

Eminent authority in every country and in every department of science, concur in classing tobacco among the narcotic poisons, than which none are more deadly; indeed, like Aaron's rod, it has secure within itself the most magical and worst of all its rivals. Nicotia, sulphureted hydrogen, hydrocyanic acid! What a den of deadliest poisons, all having their *habitat* in this colossal curse, termed tobacco!

A poison is declared to be "anything whose natural action is capable of producing a morbid, noxious, and dangerous effect upon the organization of anything endowed with life." Thus we perceive the definition is the perfect picture of tobacco's action. Acquainted with this agent for over two hundred years, medical science, speaking with the tongue of every science, declares tobacco wholly innutritious, and further still, declares it nauseous; not only that, but noxious; and further yet, a repository of deadliest poisons. From this dictum there is no appeal; in its truth medical men are forced, by their culture, to concur. But even then they dandle with Delilah till shorn of strength, and science must still be summoned and held aloft for the healing of the nation. If tobacco is a poison, it ought to act as such, and it may be safely affirmed it *has no other action!*—no other use in medicine, than to depress vitality. Thus it nauseates, it paralyzes the nerve centers, producing relaxation of the muscular system, and produces such dreadful prostration that medical literature is full of warning, and abounds with reported cases of fatal poisoning by this agent. When medical science was in her cradle, and chloroform in the embrace of chaos, ere anæsthetics had come, as the olive leaf dove, to the ark of Æsculapius, surgeons soothed their suffering patients with powerful potations of tobacco, and thus they utterly prostrated the vital powers, relaxed the muscular system, and then proceeded to reduce laxations! How direful must have been a patient's difficulty, if half so dreadful and distressing as the remedy.

It may be affirmed and demonstrated of tobacco, what is strikingly exceptional, namely, that it alone of all the vegetable kingdom possesses two active principles—the one an alkaloid, and the other oil, and both the deadliest of poisons.

It has been urged in support of fashionable poisons, that because multitudes use them, therefore they can't be especially dangerous; but professional science and experience teach that there isn't an agent in the entire armory of toxicology, but the human system, by continued use, may at length be brought to tolerate it.

One-fifth grain of strychnia, or one grain of morphia, will destroy life, yet, by constant and long continued use, the blunted susceptibilities of the nerve centers may be made so to tolerate these and like poisons that eventually enough may be taken to destroy fifty men. It is demonstrated in the observation of every one that the use of noxious agents, especially tobacco, begets a morbid appetite which demands that continually more of it *may* and *must* be employed to produce the same impression.

Such we know are facts respecting what is noxious, but is not the case with what is nutritious. Medical science is not satisfied with *statements*, but sounds the depths in search of a *philosophy* for asserted facts, and she declares, in this regard, that nutritious agents create and renew nerve cells and structures, and endow them with the finest physiological sensibilities, while noxious agents disturb the conditions essential to their renewal, and so benumb and paralyze their normal sensibilities, and produce inevitably the pathological and characteristic condition of requiring continually more of the disturbing poison to produce the same impression. With these truths we enter the most fascinating field in nature to consider the conduct of this agent in the laboratory of life. Nowhere has Deity evinced such evidences of an intelligent, divine supernatural as here presented in the adaptation of means to ends—in the perfect play of affinities and forces ever operative in the construction and destruction, the waste and renewal, of this physical citadel that enshrines an immortal soul. The whole sublime but sensitive train of transition involved in the conversion of solid food, first into fluidity, and under the auspices of vital force, transformed upward through intricate gradations till it attains the climax of its course in other solid forms, either of flesh or bone or brain, and then the oxidation of these and the evolution of heat and force, is the perfect process of what we term digestion. The brain is the depot of life's dynamics! It is the sun of the physiological system which, with its accessory centers and nerve cords, receive and transmit to the system a force that propels the mightiest and minutest processes of physical life.

But the ability of these organs—as instruments of the mind—thus to receive and transmit this vital force, depends essentially on their structural health and perfection. Paralyze or impair the perfection or structural integrity of the brain, disturb the subtile harmony of those changes of waste and renewal ever operative and essential to its structural perfection, and at once its power is impaired to forcibly and healthily perform its functions; and this adverse influence is precisely the action of tobacco as a depressing poison. The proposition is plain, the truth is self-evident and irresistible, that, with the nerve centers thus benumbed and blighted, and the vital force impaired, then every digestive process dependent on the harmonious action of vital force is weakened and discordant, and the physical and mental man is deranged to the extent that the physical machinery is injured.

The noxious influence of tobacco is more actively operative upon one class of persons than upon others. I may, therefore, for convenience, divide the victims of tobacco into two classes, assigning to the first class all those who do manual labor. These suffer least from fashionable poisons, because the deadening influence of noxious agents upon the nervous system is largely counteracted by physical toil, which strengthens the entire system and conduces to health; and thus it is that active poisons are thought to "kill slowly," and laboring people live long, apparently uninjured, and practice poisonous indulgences. In all this great and glorious class of humanity, however, may be found the fruits of tobacco's use, in the form of cancer on the lips and tongue, dyspepsia, constipation, and hemorrhoids. But let us consider the other class, wherein are included ladies and gentlemen of wealth, of fashion, and of leisure, those who live idle as well as those devoted to literary pursuits and purely sedentary occupations. Physicians, ministers, and lawyers are of this class, and in all these we find paralysis very prevalent, and that diversified and interminable train of nervous derangements whose name is legion. With constitutions enfeebled by physical inactivity and sensibilities heightened by social and literary culture, consider for a moment the effect upon these highly nervous natures. To all of this priceless portion of humanity the use of tobacco is unmixed evil and rapidly ruinous.

Again, it is affirmed by eminent authority that tobacco is the most prolific, if not, indeed, the only source of delirium tremens.

First, the ancients were entirely unacquainted with these terrible terrors of the inebriate, and the records beyond the discovery of tobacco (1560) reveal no case of *mania a potu*.

Second, the normal action of tobacco is the production of tremens, and the most frightful forms of delirium tremens are daily produced by the use of tobacco alone.

Third, it is rarely possible to find an inebriate who does not use also tobacco, and careful inquiry will confirm the statement that, with 90 per cent of such cases, the tobacco habit was first formed. Its influence deranged the nerve centers, an initial tremens was entailed upon the nervous system, which suggested to the morbid taste of the sufferer the soothing, sedative action of alcohol, and thus the allied agents forge for each other and fasten more firmly the chains of the servilest slavery.

I have employed professional science to loosen the pillars of tobacco's position, and with authority and with argument have carefully criticised its action and influence on the functions and forces of organic life. Earnestly in this direction I invoke the sober judgment of scientific medicine, and when you shall have ordered tobacco to abdicate, then only will it fall from popular use and favor, and with that will end the ruin it has wrought.

In view of these truths, scientific and self-evident, in the name of science that classifies all knowledge, in the name of science that seeks the essential nature of things, in the name of science that truthfully interprets the teachings of nature, issue the edict of your eminent authority and drive from popular use and favor this poisonous plague, and when this is secured a heavenly halo of light, an ineffable effulgence, will open up over the poisonous wastes of the world a broad and bright and beautiful pathway of crimson and of gold, wherein garlanded angels will gladly gather, proclaiming "peace on earth and good will toward men," and from highest heaven all over the earth shall you cause to be heralded God's emancipation proclamation to a world that is wasting its highest and holiest possibilities in the ruinous, depressing practice of popularized poisons.

* An address before the Madison County Medical Society.

Fish Killed by Electricity.

A correspondent of *Land and Water* says: A curious incident of the whole of the occupants of a small fish pond being destroyed by a flash of lightning, is reported from Seck, Grand Duchy of Nassau. The *Nassauer Bote* states that during a very heavy thunder and hail storm at night time, a flash of lightning struck a small pond, well stocked with various kinds of fish, the property of the pastor of the parish. The following morning the whole of the fish were discovered dead upon the surface of the water. They had all the appearance of having been half boiled, and crumbled to pieces at the least touch, just as is the case with fish after being boiled. Neither any external nor internal injury could be observed, the scales being intact and the swimming bladder filled and well preserved. The water in the pond was still muddy and dull the morning after the storm, as if the lightning had only then struck it.

Our Chief Cities Eighty-five Years Ago.

The South Carolina and Georgia Almanac for 1794, a copy of which has fallen into the hands of the Charleston, (S. C.) *News*, contains a table in which the populations of the chief cities of the United States are set down as follows: Philadelphia, 42,520; New York, 30,000; Charleston, 20,000; Boston, 18,000; Baltimore, 13,503; Newport, 6,000. At that time the entire population of the country was less than 4,000,000.

AMERICAN INDUSTRIES.—No. 27.

THE MANUFACTURE OF LEATHER.

The industry which forms the subject of this article is of very ancient origin, and it is doubtful if there exists to-day a line of manufacture whose processes have suffered so little change in the course of time as that of leather making. It cannot be said that the leather of to-day is superior to that of a hundred years ago: it is true the processes have been improved, so that less time is required than formerly, but there is no radical change in the materials or methods of leather making. The machinery used in handling hides during the process of tanning, and the methods and machinery for treating the hides after they become leather, have been greatly improved, so that the manufacture of leather is now conducted in accordance with the spirit of the times.

The leather interest is one of the most important of our day, employing a greater number of hands than any other mechanical industry excepting carpentry and other wood working. The yearly product of the combined leather interest exceeds three hundred millions of dollars ($300,000,000). Agriculture and the railroad interests alone surpass the leather interest in values created and involved.

It is not the purpose of this article to trace the history of leather making, nor to give all of the details of its manufacture, but to briefly describe one of the oldest, largest, and most successful leather manufactories in the country. We refer to the establishment of Messrs. T. P. Howell & Co., of Newark, N. J., whose works we illustrate on our title page.

This house dates its existence from the time when Newark, now a city of 130,000 inhabitants, was but a village of 8,000 inhabitants, and New York city was no larger than Newark is at present. The establishment was then small, and engaged principally in the manufacture of patent leather, then a comparatively new article in this country. In 1848 the buildings of S. M. & T. P. Howell having been destroyed by fire, new ones were built on the site of the present works, and in 1855 the style of the firm was changed to T. P. Howell & Co. Since that date new buildings and improved machinery have been added as required, until the establishment ranks as one of the largest and best appointed in this country, and in the production of patent and enameled leather it is the largest in the world.

The buildings of the Newark tannery cover about four acres, and there is a tannery in Middletown, N. Y., owned by the same firm and doing the same kind of business.

In this establishment none but the choicest hides are used, of which they have a regular daily supply, received by special train, and transferred to the hide house shown in one of the upper views in the engraving, where the horns and tails are removed, and they are trimmed and otherwise prepared for future operations. In preparing a hide for tanning, the first operation is that of soaking in water. For this purpose they are placed in large numbers in pools; from the pools they are taken to the beams, where fatty substances are removed; they are then placed in vats containing a lime solution and allowed to remain for a week. The lime dissolves the hair sheath and combines with the fat of the hide to form an insoluble soap. When the hair and the epidermis yields to the touch the skins are taken out and scraped on the beams, with a curved two-handled scraper called the unhairing knife. After the removal of the hair the flesh is removed by means of a knife similar to the unhairing knife.

After these operations, and before subjecting the hide to the tanning process, the lime as well as dirt and animal impurities must be removed. This is accomplished by first submitting the hide to a process called bating, and then working out the bate by means of washing and by the use of a sort of burnishing tool or rubber that is brought to bear upon the hide as it is laid over a beam. The washing is accomplished by beating the hides in a machine resembling a fulling mill, and tumbling them in huge wooden cylinders supplied with a stream of water. When the hides are removed from these cylinders they appear very clean and white; they are now ready for the process of tanning, and are conveyed to the tan vats, where they are immersed in a strong liquor prepared from the bark of oak and hemlock. Here the hides remain, with the exception of short intervals of handling, for a period varying with the purpose for which the leather is intended—from two weeks to two months.

To hasten the process the liquor in some of the vats is constantly agitated by large paddle wheels, seen in one of the middle views, which not only revolve the liquor but the hides also. After the tanning is completed the hide is transferred to the curriers, who shave it on the rough flesh side, reducing it in thickness, removing irregularities, and making the rough side smooth and even. The skin during this process is supported on a beam, the workman preventing the skin from slipping by pressing his body against the portion hanging over the end of the beam. The knife used for this purpose is wide and straight, having at one end a T-shaped handle, and at the other a straight one. It has a peculiar wire edge, kept in order by a burnisher. After shaving, the skins are thrown into fresh liquor, retanned, and then scoured. For this purpose they are placed upon large tables and worked with a tool called a slicker. The department in which this work is carried on is shown in one of the middle views, and the "slicker" is represented in detail in the upper portion of the view.

The leather made in this establishment is split into three parts. The grain side is enameled in various colors, and is used for carriage tops and upholstering. The middle is japanned for carriage and harness use, and the flesh side is used in shoe manufacture and for other purposes.

The portion of the skin which is japanned is stretched on a wooden frame, and after receiving a black groundwork—which is allowed to dry—a coating of japan varnish is applied and baked on. Patent leather is made in different colors for different purposes, and although this particular article is a specialty with this house, we are informed that with the exception of sole leather, there is nothing in the line of leather that is not made here.

It is gratifying to add that the vast product of this immense concern is not only used in the United States and Canada, but is also shipped to all parts of the world. The firm commands a very large trade in England and her Colonies, South America, and all the principal foreign countries. They are as well acquainted with the demands of the foreign markets as with the requirements of their home trade.

Messrs. T. P. Howell & Co.'s New York house is located at 77 Beekman street.

MECHANICAL INVENTIONS.

A machine for hot-pressing cloth, in which the cloth is made to pass between a hollow press box heated by steam and an adjacent pressing cylinder, has been patented by Mr. Ernst Gessner, of Aue, Saxony, Germany. The improvement consists in the combination, with two or more cylinders and corresponding press boxes arranged to give a repeated pressure upon one side, or successive pressures upon opposite sides of the cloth, of a carrier belt, roller, or equivalent device, adapted to receive the cloth from one press box and prolong its travel in its passage to the next press box, whereby a sufficient time is allowed for the goods to become cooled before receiving the second hot-pressing.

An improved steam generator, patented by Mr. Dan Abell, of Carson City, Nev., consists in combining with a steam generator feed water pipes extending through the flues and projecting through an opening at the front and a cap for covering the ends.

Mr. Rosseel Payne, of Ox Bow, N. Y., has patented a plow that will remove the snow from a railroad track and deposit it either to the right or left of the track, as may be desired, by means of a wheel with cutters revolving in the vertical plane and attached to the forward end of a platform car.

Our Increasing Export Trade.

The following table from the annual report of the Chief of the Bureau of Statistics shows the greatly increased values of the exports of our principal domestic productions during the fiscal year 1879, as compared with the exports of the same articles during 1868 and 1878. It should be remembered that the increase in the value of the exports has been attended by a considerable fall in the market price of certain of the articles named in the table:

Commodities.	Value exported, 1868.	Value exported, 1878.	Value exported, 1879.
Agricultural impl'mnts..	$673,381	$2,575,198	$2,933,388
Animals, living	733,395	5,844,653	11,487,754
Bread and breadstuffs..	69,024,059	181,777,841	210,355,528
Coal	1,516,220	2,359,467	2,319,398
Copper and brass, and m'n'f's of, not including copper ore.....	196,329	2,909,357	3,031,934
Cotton, m'n'f's of....	4,871,054	11,438,660	10,853,950
Fruits of all kinds	406,512	1,378,106	1,916,382
Iron and steel and m'n'f's of, exclusive of firearms, but including scales and balances, sewing machines, and fire engin's	5,401,396	13,784,307	12,766,294
Leather of all kinds	607,105	7,093,020	6,800,070
Mineral oil (illuminat'g)	19,752,143	41,513,676	35,999,862
Provisions	30,436,642	123,556,323	116,858,650
Sugar, refined.....	313,378	4,508,148	6,164,924
Tallow.....	2,540,227	6,695,377	6,934,940
Total.....	$136,861,751	$405,433,828	$428,422,164

The total value of domestic exports during 1879 was $698,340,790, making a balance of trade in our favor of over $269,000,000.

The Ebb of the Chinese.

The Chinese in California have begun to go. The steamer that sailed from San Francisco for Hong Kong on the 15th, took 901 of them to their native land. The port statistics of San Francisco show that the arrivals of Chinese during the year ending November 1, were 6,128, and departures 8,746—of whom 6,229 went to China, and 2,517 to Honolulu—the excess of departures over arrivals being 2,618. It is estimated that there are 62,000 Chinese on the Pacific coast, which shows that this population is decreasing instead of increasing, for when the anti-Chinese agitation was begun, a few years ago, the estimate was 100,000. The total number of Chinese arrivals for the twenty years ending December, 1878, was 230,430, and the departures and deaths 133,491. At this rate the Chinese cheap labor will soon be unknown in California.

Trade Marks.

The Committees of Congress have lately reported in favor of an amendment to the Constitution providing for the legalization of trade mark registrations, and it is expected that the necessary bill will be promptly passed by the required majority—two-thirds in each branch. The constitutional amendment will then be submitted to the consideration of the legislatures of the thirty-eight States, and when adopted by three-fourths of the States, the new provision will form a part of the organic law of the republic. Thereafter Congress will have power to make a general law for the registration of trade marks.

A Proposed New Trade Mark Law.

To the Editor of the Scientific American:

I believe it is admitted that the failure of the trade mark law to give protection is a misfortune to the manufacturing interests of the country.

I suggest that Congress has a right to give incidental protection to trade marks under the power to levy and collect taxes.

Let the Bureau of Internal Revenue print and sell, to every manufacturer who desires it, an internal revenue stamp, bearing the trade mark of that manufacturer, the same as is now done to proprietors of patent medicines. The cost of these stamps should be merely nominal, but their forgery should be visited with all the penalties now inflicted for counterfeiting revenue stamps. Fines could be divided between the owner of the trade mark and the United States, or otherwise, as found best.

This imposition of a tax would be uniform throughout the United States, and therefore conforming to the requirements of the Constitution, but the payment would be optional with those who desired its protection. Such protection could be made almost absolute under the revenue laws.

I would like this idea, which I have here crudely outlined, to be criticised by your readers.

W. A. BARTLETT.

Washington, December, 1879.

The Inspection of Steam Vessels.

In his annual report the Supervising Inspector-General of steam vessels makes the encouraging statement that notwithstanding an increase of 400 vessels to the steam merchant marine of the United States since 1875, and notwithstanding the largely increased passenger capacity of the steamers built since then, there has been a steady falling off in the number of fatal casualties. These were, during the past five years, as follows; 607 in 1875, 398 in 1876, 224 in 1877, 212 in 1878, and 177 in 1879.

Attention is called to the necessity of legislation in the matter of taxation for license fees for small steam pleasure vessels or yachts, which, even though they may be no larger than a common sloop's yawlboat, are compelled to pay the same fees for license as commercial vessels of 100 tons burden, which excessive tax has in many cases actually prohibited their use, as many persons desirous of owning such vessels for their own pleasure feel unwilling to pay a fee of $25 yearly for inspection. In this connection Mr. Dumont says:

While I think it would be improper to exempt such vessels from the general requirements of the steamboat laws, however small they may be or however employed on waters open to competitive navigation, both for their own safety and for other vessels governed by said laws, I think that a fee of $5 for the inspection of such vessels, say of twenty tons burden or under, would be ample, and would encourage the building of many more than are now used, thereby benefiting one of the great industrial interests of the country.

Osage Orange Timber for Railroad Ties.

A correspondent sends a transverse section of Osage orange wood cut from a stick which, to his certain knowledge, had been lying for twelve years partly covered with earth in an old meadow. The heart wood is in perfect preservation. This timber, he says, is a rapid grower, and seems to be nearly imperishable in the ground; and he suggests that it would pay railroad companies to cultivate it for ties. Osage timber large enough for narrow gauge roads would grow, he thinks, in from twelve to fifteen years from planting. Whether it would hold spikes well does not appear

Uranium in California.

A dispatch from Fairplay reports the discovery of uranium in the Sacramento mining district. This mineral is found in Bohemia, but never before has been discovered in this country as far as known. The present discovery was made by H. L. Rice. The ore runs 60 per cent. Uranium is worth $1,000 per ton. One of its principal uses is as a coloring substance in the manufacture of glass.

Chemical Nomenclature.

The reports of the *Berliner Chemische Gesellschaft* of October 13, 1879, contains a note on the production of tetramethyldiamidodiphenylmethan and naphthyldimethylamidophenylsulphon. If the latter is heated with nitric acid pentanitrodimethylanilin and nitronaphthalinsulphite are produced.

Ifthissortofthingiskeptup chemistry willsoonberesolvedintooneword.

Extending its Use.

The flexible shaft, which so much resembles a snake, and which is used for operating drills and other instruments used in dental offices for operations on the teeth, has proved to be capable of doing heavy work, such as the boring of wood and iron. It is used also in the brushing of horses and cattle, cleaning and polishing plate glass, finishing morocco leather, and in boot cleaning. As described by a machinist, it "leads mechanical power into the more intricate ways and remote corners heretofore only approachable by the human arm, and it is apparent that manifold applications of the flexible shaft will be made in the future that are not now thought of."

The Solano—The Largest Ferryboat in the World.

The projection of this great ferryboat for the transportation of passengers and freight across the Straits of Carquinez, from Port Costa to Benicia, California, was noticed in this paper some months ago. Now that it is completed and afloat California may boast of the biggest ferryboat in the world. The dimensions of the Solano are:

Length over all, 424 feet; length on bottom—she has no keel—406 feet; height of sides in center, 18 feet 5 inches; height of sides at each end, from bottom of boat, 15 feet 10 inches; moulded beam, 64 feet; extreme width over guards, 116 feet; width of guards at center of boat, 25 feet 6 inches; reverse shear of deck, 2½ feet. She has two vertical beam engines of 60 inch bore and 11 inch stroke, built at Wilmington, Del. The engines have a nominal horse power of 1,500 horses each, but are capable of being worked up to 2,000 horse power each. Upon the deck of the Solano are four tracks extending her entire length, with a capacity for carrying forty-eight loaded freight cars, or twenty-four passenger-coaches of the largest class. The rudders are worked by hydraulic steering gear, operated by an independent steam pump. These rudders are connected with the ordinary steering gear, so that in case of any disarrangement of the hydraulic apparatus the vessel may be guided by it. The advantage of this improvement is that the immense craft can be handled with ease by one man, whereas, if the ordinary wheel and system of steering were used, six men would be required at the wheel.

Lake Erie Vineyards.

The islands at the western end of Lake Erie and the neighboring shores of Sandusky Bay are largely devoted to the production of grapes and wine. The Sandusky *Register's* annual report, just published, for 1879, shows that there are in this district 4,000 acres planted with vines, the yield for the year being in round numbers 16,000,000 pounds of grapes. The wine houses report a production of 1,526,400 gallons. Of this by far the greater part is Catawba, which holds its own as the favorite American wine in spite of the efforts to popularize native red wines made from the Concord grape, the Ives seedling, and other varieties.

The *Register* estimates that not more than one million gallons of pure juice has gone with the million and a half gallons of wine. Some of the dealers, it says, make no secret of the fact that they use spirits, sugar, and water largely, and claim that this doctored stuff is more acceptable to their customers than pure wine.

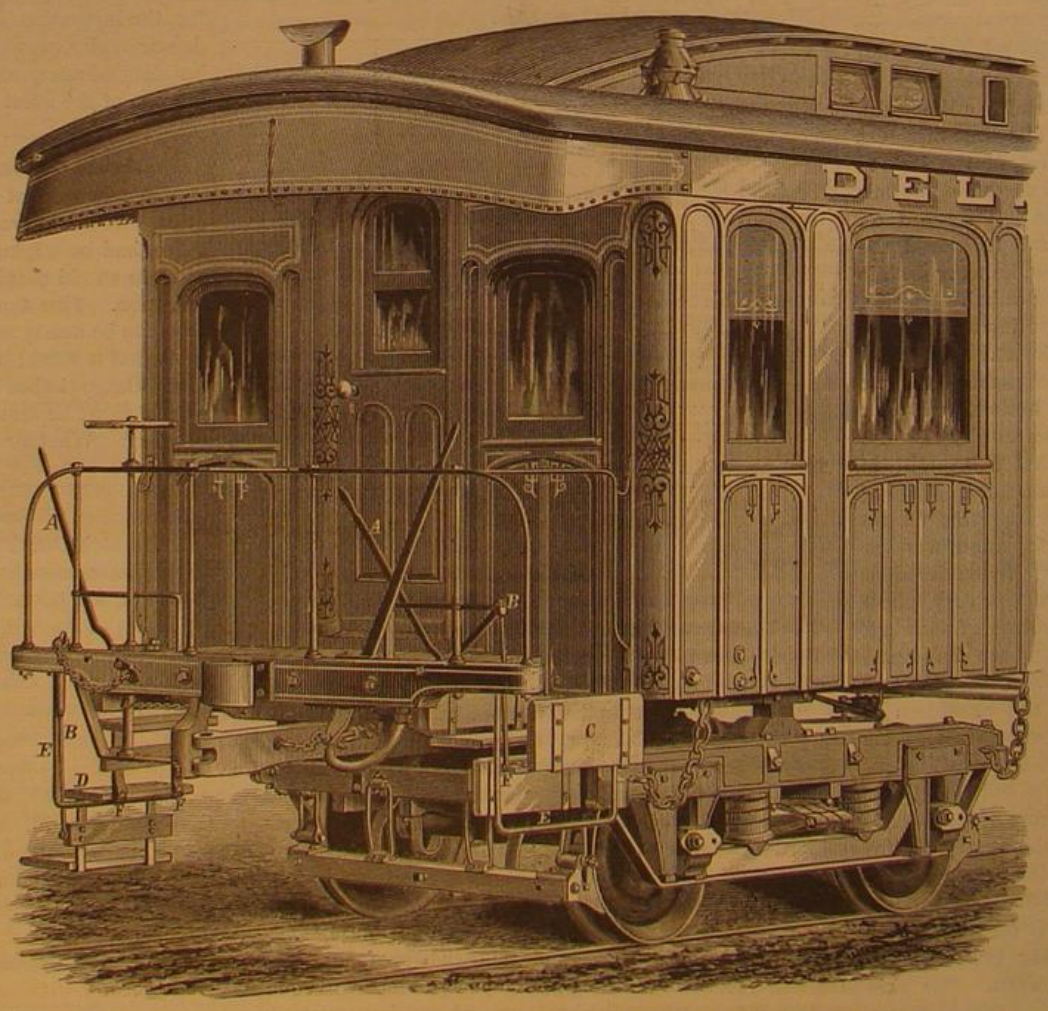
NEW CAR STEP.

The annexed engraving shows an improved folding step applied to passenger cars to facilitate the ascent and descent of passengers from the platform, and to avoid climbing and jumping in getting on and off the cars. The folding step is connected with the lower car step, and when in position for use it is supported, when let down, by a yoke that passes under the fixed step.

The folding step comes within a foot of the ground, and permits of making the risers of all of the steps shorter, and the steps are of course much easier than the ordinary ones. When the train is ready to start the steps are turned up out of the way by means of a lever, which also holds them. In this position the steps cannot be injured or broken off by obstructions on the road or by snow or ice in the winter. Another important feature is that the step when folded up forms an effectual barrier against jumping on or off the train while it is in motion, and prevents a class of accidents that have been alarmingly frequent. Another advantage is that the step may be let down at one end of the car only, thus compelling passengers to enter at that end, and admitting of a more thorough scrutiny of the passengers and a complete inspection of the tickets.

This invention has been thoroughly tested, and the steps are now in use by the Delaware and Hudson Canal Company.

Further information may be obtained by addressing M. E. Skerritt, No. 4 High street Albany, N. Y.



IMPROVED CAR STEP.

Ballasting for Railways.

With reference to "Roadmaster's Difficulties," a correspondent writes that there is no material for ballasting so good as the screenings of coal from mines or yards, either alone or mixed with some hard stone.

NEW STONE-DRESSING TOOL.

The dressing-tool shown in the accompanying engraving was recently patented by Mr. Louis C. Gilmore, of Shearman, Texas. Fig. 1 represents the upper side, and Fig. 2 the under side of the tool, showing the radial and angled grooves. The tool consists of a circular plate having in its upper surface a cavity or basin communicating with the grooves in its under surface by a central aperture. A handle is fixed to the upper surface of the tool at one side of the center. When the tool is in use the cavity in its upper surface is filled with sand or emery and water, and it is moved

GILMORE'S STONE-DRESSING TOOL.

by the handle in an elliptical path, giving it a gyratory motion. This double motion of the tool greatly facilitates the operations of sand rubbing and polishing, and the grooves are of suitable form to distribute the abrasive material to the best advantage, and to retain it until it is used.

This tool is inexpensive, and may be used for the successive operations of sand rubbing, gritting or honing, and polishing.

Where the Cold Waves Come From.

Meteorological observations have now become so extended that evidence is rapidly accumulating to enable us to determine positively the source of the cold aerial waves which sweep across our country during the winter season. The indications are that we owe them to the great area of high barometer in Northeastern Siberia, where the pressure sometimes exceeds 31·50 inches, and the temperature falls as low as 76° below zero. The pole of greatest cold is in the neighborhood of Yokutsk, on the Lena, where the average thermometric reading in January is 41° below zero, and where the severest cold exceeds by ten degrees that experienced by explorers in high arctic regions. This is also the region of the highest barometric pressure known in winter; and from it, doubtless, proceed the waves of intense cold which play so large a part in our winter experiences.

The International Dairy Fair.

The second international dairy fair was opened in the American Institute building, December 8, with a fine display of dairy products, cattle, and machinery. The exhibits included butter, cheese, dairy cattle, implements and machinery for butter and cheese making, and agricultural designs and models for creameries, cheese factories, dairy buildings and farms.

In his opening address Mr. Francis B. Thurber gave the following facts and statistics collected by him during a recent visit to Europe:

The number of milch cows in Germany, as given by the latest statistics, is	8,961,221
In France	4,513,765
Great Britain and Ireland	3,708,766
Denmark	800,000
Sweden	1,356,576
Norway	741,574
Switzerland	592,463
While in the United States the latest statistics and estimates make the number of milch cows about	13,000,000

The quantity of butter and cheese per cow produced in the different countries varies so largely that no trustworthy average can be made, and the statistics, which embody only the quantities exported and imported, give but little idea of the total production. Some idea of the magnitude of the interest, however, may be formed from the fact that in this country alone, during the year 1878, three hundred and forty million pounds of cheese were produced, and nine hundred and sixty million pounds of butter. Of this but 3·9 per cent of the butter was exported, while of the cheese 41·6 was exported. Denmark, with but sixty million pounds total production of butter, exports thirty millions, or 50 per cent.

These export figures illustrate an important fact—namely that American dairymen have appreciated and catered to the tastes of cheese consumers in the great market of the world, Great Britain, while they have neglected to study the wants of the same consumers of butter. There is undoubtedly a difficulty in transporting butter long distances and delivering in perfect condition, but this is a difficulty which can be overcome, at least in a great degree. The great difficulty has been that so small a proportion of the immense production of butter in the United States has been of good quality, that really fine butter has commanded higher prices at home than abroad, and there is quite a sufficient quantity of poor butter to be found in most of the foreign markets.

Butter makers in other dairy countries have, however, made great progress in improving their product, and the average quality is much better than it was five, or even three years since. Improved dairy appliances and machinery, much of it of American origin, have been extensively introduced both on the Continent and in Great Britain; more attention has been paid to using the best salt; governmental dairy schools have been established in the continental dairy countries, even Russia having the enterprise to take this step, and scientifically educated dairymen are furnished by these schools to the principal dairy districts of their respective countries. Margarine butter, or oleomargarine as it is called here, has also assisted in bringing about this result, as it competed successfully with the poorer grades of ordinary butter, and obliged European butter makers to make an effort to produce a superior article.

In Great Britain, the amount of intelligent effort which is being directed toward the improvement of dairy products, especially butter, is surprising, and if American butter-makers would enlarge their foreign market, they must in the same manner strive to increase the supply of good butter which is produced, and thereby lower prices to a point which will enable us to compete in the principal butter markets in the world. That we have the ability to do this no one can doubt who knows the progressive spirit of the American people. Touching the scope for profitably enlarging the variety of cheese made in this country, Mr. Thurber remarked that a prominent English dairy authority has said that "cheese is made in the dairy," meaning thereby that almost any variety of cheese can be manufactured in countries other than those in which it originated. This has been proved by the successful manufacture in the United States and in France of the Gruyère, which, as we all know,

originated in Switzerland. It has also been proved by the successful manufacture in Russia of the English Cheddar and the Dutch Edam cheeses, and even the odorous Limburg confirms this assertion, for its manufacture has been so successfully domesticated in the United States by our German fellow-citizens that, as suggested by a member of the Paragraphers' Association, "the difference from the imported article cannot be told unless you are off to the windward three miles."

THE SEA SERPENT ACCOUNTED FOR.

BY DANIEL C. BEARD.

The New York Sunday *Sun* of November 30 gives the following description of the Sandy Hook monster, as related by eye witnesses, who are all members of a Sandy Hook life saving crew:

Samuel Kittell was the first to see it. He says: "I looked out and saw a large head and portions of the body of a most terrible looking monster. It was wriggling slowly along like a snake, the head and several portions of the body showing above the water. It was not a whale, as there was not more than twelve feet of water where it was, and a whale as large as that would necessarily have been in view all the time. But this thing would disappear altogether at intervals. No fin could be seen anywhere on the back. The body looked round and much larger than a pork barrel. It was of a blackish-brown color. I am sure it was not a whale, but cannot say what it was. It was a stranger to me."

THE SANDY HOOK SEA SERPENT.

George Lohsen makes the following statement: "I took the glasses and ran down to the water's edge and leveled the glasses at the monster's head. The front of the head was square, with a projection about two feet long extending from the top of the head. The eye was seven or eight inches in diameter, of a shiny black, and it appeared bulged out considerable. There looked to be a white rim around it. The animal's length was at least 300 feet from the head to the tail, as seen by us, not making allowances for the crooks in the body."

Harry Foster, another of the crew, says: "I got up and looked out, and saw the devilishest looking fish I ever put my eyes on. It was moving along about as fast as a man could walk. I took a pair of strong glasses and followed it along the beach. It was not more than 300 yards from the shore. With the glasses the head looked as large as a hogshead. The front of the head looked square, and was about three feet high, with a projection two feet long extending from the top of its head. The eye toward the shore was as large as the top of my hat, was shiny black, and had a white edge. It had a very fierce look. . . . From the head to the tail it was at the least calculation 300 feet long. It was moving along the water the same as an eel. The head and several parts of the body were constantly out of the water. It was some species of serpent. It was certainly not a whale. . . . This thing did not spout, and showed no fins on any part of its body excepting on the tail, which was formed like that of an eel."

Well authenticated facts now prove that nature produces monsters as wonderful and startling as the most vivid imaginations of the romancer can invent. Victor Hugo's devil fish has its counterpart in the great cephalopod which was for a long time on exhibition in the New York Aquarium.

There is no doubt, in my mind, that the monster lately seen off Sandy Hook by the crew of the life-saving station was no other than a large cephalopod. That these animals often attain enormous dimensions is a well established fact, but that this one was "three hundred feet long" is scarcely probable.

One seen in the neighborhood of Van Diemen's Land is described as resembling a cask, its long arms having the appearance of snakes wriggling upon the surface of the water. This creature, says Kent, was probably a large poulpe or octopus. In December, 1861, the crew of the French corvette Alecton, engaged in battle with a calamary, whose body alone was estimated to be twenty feet in length, and its weight 4,000 pounds! It escaped, leaving a portion of its flabby body in the possession of the brave sailors, who were only restrained from following it in small boats by the officer in command, Captain Boyer.

October 26th, 1863, two fishermen noticed off Great Bell Island, Conception Bay, what they supposed to be a large bale of goods from some wreck. It was not until they actually struck it with a boat hook that they saw the terrible staring eyes of an immense poulpe; two of its numerous arms were thrown across the boat; one of the men severed these with a hatchet, the creature then moved off backwards. The amputated arms left in the boat were brought to St. Johns. The Rev. Mr. Harvey, who was the first to examine and describe these limbs, found that one fragment measured nineteen feet, although a large portion of it had been destroyed before it was rescued from the fishermen, and there is no way of determining how much more remained attached to the body of the animal.

Many other well authenticated instances could be enumerated to prove the immense growth of this family of marine monsters, but those given are sufficient to establish the fact that these "monarchs of the ocean," as Kent calls them, do exist, and that their main characteristics are as follows:

1st. The body is large and round, and described as resembling sometimes a cask, and again a bale of goods.

2d. The eyes are large and staring.

3d. The arms or tentacles are of great length, and have a snake-like appearance and motion.

On comparing these peculiarities with the descriptions of the Sandy Hook leviathan, as obtained through the enterprise of the *Sun* from eye witnesses, the similarities, even to the expressions used, will be apparent.

The fin, or what was supposed to be the serpent's tail, can be readily accounted for by the fact that in some species of the cephalopod the longest tentacle widens and flattens at the end, and might easily be mistaken for a caudal fin. When moving through the water these animals bring their many arms together in a line, thus affording the least possible resistance, and propel themselves by ejecting water from their siphons.

Imagine one of these horrible creatures, with its sac-like body half submerged in the shallow water, its large protruding eyes above the waves, swimming with its long snake-like arms or tentacles trailing far behind, and you have a very fair picture of the wonderful gigantic hydrophidian or marine serpent of which we have had such thrilling accounts.

A Singular Specimen.

Mr. E. L. Wood, of Eastland City, Texas, sends us a drawing and description of a curious bone, through which passes an iron ring, now on exhibition in a drug store in that town. It appears to be a shank bone, the iron band being so interlocked with it that to separate them one or the other would have to be cut or broken.

Mr. Wood says: "The side of the bone encircled by the band has a smooth appearance, while its opposite side is rough and serrated. The band is about 12 inches in circumference, 2 inches wide, 3/8 of an inch thick, and is beveled from its upper edge downward. At the square opening near where the bone is supposed to have joined the hoof, and extending upward several inches, is a porous formation, of the appearance and consistency of bone. Did the iron band pass through the foot and ankle, and is this linking together the result of ossification?"

The Last Number.

This issue closes another volume of this paper, and with it several thousand subscriptions will expire.

It being an inflexible rule of the publishers to stop sending the paper when the time is up for which subscriptions are prepaid, present subscribers will oblige us by remitting for a renewal without delay, and if they can induce one or more persons to join them in subscribing for the paper, they will largely increase our obligation.

By heeding the above request to renew immediately, it will save the removal of thousands of names from our subscription books, and insure a continuance of the paper without interruption.

New Tanning Materials.

We translate the following paper from the *Chemiker Zeitung:*

The number of the tanniferous matters introduced into trade has been of late decidedly increased. This result is due in part to the penetration of travelers into uncultivated lands, and partly to the fact that the old traditional astringents have become scarcer and dearer. The oldest known and formerly almost exclusively used wares, such as oak bark and sumac, are now insufficient for the demand, so that many substitutes have been found necessary, both in dyeing and tanning. These have almost exclusively been derived from foreign lands. Many were to be found at the Paris Exhibition of 1878, and have excited the attention of practical men. Some of them have since taken a place in the market, and others deserve to be brought into use. This induces us to make a brief mention of some kinds.

Species of Acacia.—These trees, natives of Australia and Africa, are known for their tanniferous bark, their pods, and their gum. The tanning barks known in commerce are nearly all derived from Australia, and are known as mimosa bark. Their percentage of tannin ranges from 15 to 32, but the kinds generally imported average 28 per cent, or two and a half times as much as good oak bark. The Australian kinds are: *Acacia harpophylla*, a very rich sort, from Queensland; *A. cunninghami*, the black wattle, from Queensland; *A. mollissima*, likewise known as black wattle; *A. retinoides*, from Victoria; *A. pycnantha*, or gold wattle; *A. subporosa*, from Victoria and New South Wales, one of the poorest sorts; *A. penninecis*, the hickory acacia, with about 20 per cent of tannin; *A. decurrens*, also called wattle tree; *A. melanolylon*, the black wood of Tasmania and New South Wales; *A. dealbata*, the silver wattle of Tasmania; and *A. leiophylla*. All these species are in use in Australia, and are imported into Europe, and especially into England, under the name of mimosa bark. Those preferred on account of their large proportion of tannin are: *A. harpophylla, mollissima, pycnantha, leiophylla*, and *cyanophylla*, the four latter of which average from 24 to 32 per cent.

The writer remarks that as no German merchant obtains these barks except *via* London, it may be important for German merchants to know that there is a nearer and more convenient source of these valuable barks in Algeria. [Not surely nearer than London?] In this French colony the Australian acacias, and especially the four last mentioned, have been cultivated for some years. The seed pods of the acacias, with the exception of *A. leiophylla*, are very rich in tannin. The production in Algeria is very trifling in comparison to that of Australia, but the plantings are being extended, and the trees grow quickly.

Algeria is a land very suitable for tanning materials; *Pistacia lentiscus* grows there in quantity, especially in the department of Oran. The rind is poor in tannin, but the leaves contain 12 to 15 per cent. This tannin has little color, and might be used by dyers in place of sumac. The leaves are oval, pointed, and are easily ground and extracted.

The rind of the cork tree (*Quercus suber*) is a rich Algerian tanning ware containing from 12 to 16 per cent of tannin. It forms in Algeria extensive woods, but the true bark is never stripped till the trees are too old to yield cork, when they are cut down. This applies also to the cork trees of Sardinia and Spain. The bark is chiefly sent to France, Italy, and England.

The evergreen oak (*Quercus ilex*) is being rooted out wholesale in Algeria to make room for the cultivation of wheat. The kermes oak (*Quercus coccifera*) is being treated in the same way. The root bark is very rich in tannin, and is extensively used for tanning in the south of France.

A bark which at the Paris Exhibition excited some attention by its high percentage of tannin is the suobar. It contains 24 per cent, is obtained from *Pinus halepensis*, and grows in Tunis. It occurs in pieces, which in form and color (?) resemble potsherds. It dyes a brown-green with iron mordants.

Besides the quebracho wood, South America furnishes four other important tan wares. The algarobilla of Chili is the pod of *Balsamo carpum brevifolium*, a tree which grows wild in rocky districts of Chili. The natives gather the fruit before it is perfectly ripe. When they are fully ripe the epidermis breaks easily, and the tannin, which forms a yellow, crumbly layer under it, is lost. The pods are nearly cylindrical, and resemble those of the locust tree. They contain 40 to 60 per cent of tannin, and a small quantity of a yellow coloring matter. The tannin is readily soluble in cold water. The present price is about £28 per ton, but the production does not exceed 200 to 300 tons. The harvest takes place in February. Valparaiso is the center of the trade. It is used in Europe, especially in North Germany, for tanning, and is preferred for uppers and harness leather, as it imparts a peculiar softness. Its importation is at present suspended owing to the war between Chili and Peru.

Chili furnishes two other tanning materials, one of them very important and the other capable of becoming so. The bark of *Persea lingay*, a tree belonging to the family of the Laurineæ, serves in South America, and especially in the Chilian province Valdivia, for tanning the so-called Valdivia leather, which is now imported in quantities. Some years ago attempts were made to introduce this interesting and useful bark into Europe, but unsuccessfully. Now it is imported by way of Hamburg, and has given very good results everywhere. The bark is red-brown, soft, and very porous, and can, therefore, be easily extracted with water. It contains 20 to 24 per cent of tannin, as well as a considerable quantity of a slimy matter, which is very important in tanning operations, as it promotes the swelling of the hides. There is also a small quantity of soft fatty matter of a peculiar odor. In the south of Chili there are inexhaustible forests of the *Persea lingay*, so that we may hope there may soon be found more importers of this useful bark, which by its rapid action in tanning, and by the weight of the leather produced, may assist the European tanners to withstand Chilian competition. While this bark is used for sole leather, the rind of *Laurus peumo* is used in Chili for tanning uppers. This latter bark has not yet been imported into Europe on the large scale.

Another Chilian bark is that recently imported under the name of Churco bark, *Oxalis gigantea*. In the first place this bark is not derived from any species of *Oxalis*, and an *Oxalis gigantea* does not exist. It is now known that this bark is obtained from the roots of a large species of fuchsia (*Fuchsia macrostemma*). The percentage of tannin is on the average 24 per cent, and the color of the watery extract is a dark brownish yellow.

Several other South American barks were to be seen at the Paris Exhibition, which were really worth importation, though they are at present neglected. We mention in the first place the Nancite bark, from *Malpighia punicifolia*. This bark, known also as Manquitta bark, contains from 20 to 30 per cent of a very light colored tannin, and comes from Nicaragua. The same region exhibited the Nacascolo bark, obtained, according to some, from Pernambuco wood (*Cæsalpinia echinata*), and according to others from the divi-divi tree (*Cæsalpinia coriaria*). It contains only about 3 per cent of tannin.

In Venezuela there are also several barks rich in tannin. That of the "roble colorado" (*Tecoma pentaphylla*) contains 27 per cent of tannin, accompanied by a considerable quantity of an orange-red coloring matter, which is also soluble in water. It is met with in large, thick pieces. The mangel bark (*Rhizophora mangel*) comes likewise from Venezuela, and contains, if obtained from young stems, 24 to 30 per cent of tannin, and much red-brown coloring matter. The old, thick bark is poorer in tannin. The cuspa bark, also from Venezuela, is poor in tannin. Peru yields the pods of a shrub, locally known as pay-pay (*Inga fenillei*). They are large, thick, and deep reddish brown, and contain 24 per cent of a tannin, which is almost colorless, and admirably adapted for the uses of the dyer. It deserves to be imported. —*Chemical Review.*

Health at Home.

At the recent Sanitary Congress at Croydon, England, the president, Dr. B. W. Richardson, F.R.S., gave an address on "Health at Home." That there was no place like home was a saying peculiarly appropriate to his subject, for the river of national health must rise from the homes of the nation. He would lay down a few golden rules for securing health at home. First he would put sunlight. Whether your home be large or small, give it light. In a dark and gloomy house one could never see the dirt that polluted it; unwholesome things got stowed away and forgotten, the air became impure, and soon some shade of ill health was engendered in those persons living in the house. Not only was the mind saddened in a home that was not flushed with light, but sunlight was of itself directly useful to health. The practice of placing sick people in dark and closely-curtained rooms was alike pernicious to body and spirit; and, moreover, he had found by experiment that certain organic poisons analogous to the poisons which propagate epidemic and contagious diseases were rendered innocuous by exposure to light.

He would next refer to the allied topic of night and hours of sleep. If it were good to make all possible use of sunlight, it was good equally to make as little use as possible of artificial light. Artificial lights, so far, had been sources of waste, not only of the material out of which they were made, but of the air on which they burned. In the air of the closed room the present commonly-used lamps, candles, and gaslights robbed the air of a part of its vital constituent, and supplied in return products really injurious to life. Gaslight was in this respect most hurtful, but the others were bad when long kept burning in one confined space. The fewer hours after dark that were spent in artificial light the better, and this suggested, of itself, that within reasonable limits the sooner we went to rest after dark the better It was of the greatest importance in a healthy home to let every person have a separate bed, and the clothes should be light and warm. As the bedroom was the room in which one-third at least of the whole life was passed, that ought to be the room on which most trouble after health should be bestowed. The rule followed was the reverse of this. The bedroom should be so planned that never less than 400 cubic feet of space should be given to each occupant, however good the ventilation might be. The walls should be colored with distemper or with paint, that, like the silicate paint, could be washed three or four times a year. The windows should have nothing more than a blind and a half muslin curtain. The floors should have carpets only round the beds, without valances from the beds. The furniture should be as simple and as scanty as was possible, the chairs free of all stuffings or covers that could hold dust. Of all things, again, the room should be kept clear of vestments not in use. From time to time a fire should be made in every bedroom, that a free current of atmospheric air might sweep through it from open doors and windows. Dry scrubbing was by far the best mode of cleansing the floor. An equal temperature of about 60° F. should be maintained, as far as possible, throughout the house, a free access of air, and, above all, dry.

His last rule he would take from the more strict of our Jewish fellow-subjects, that of a complete household-cleansing once a year; the cleansing of every article, great and small; of every wall and floor, door and lintel; and the removal and destruction of all organic refuse, however minute.

The Treatment of Diphtheria.

Dr. Thomas Gurney, senior physician to the City Dispensary, London, makes the following contribution to the *Lancet:*

"Since I have held the position of physician to the City Dispensary I have had considerably more than one thousand cases of disease of the throat under my care, many of which, both in public and private practice, have been cases of diphtheria. About this, by far the most serious disease of the throat, we have much to learn. The stiffness in the neck, the disturbance of the circulation, the rapid rise of temperature, before any affection of the throat is observed, all point to its being a blood poison calling for prompt and decisive treatment.

"The two questions that arise when called to a case of diphtheria, as, indeed, in all diseases, are: How does the disease tend to kill the patient? and, How does nature endeavor to rid herself of the disease?

"Diphtheria tends to kill by suffocation and by its poison exhausting the vital energy. Suffocation may be either accidental, or as a natural result of the throat affection—accidental if, when the membrane is thrown off, it becomes lodged in the larynx; natural if the swelling inside the throat shuts off the supply of air to the lungs. Nature will attain the mastery over her enemy if the strength be kept up and the deposits arrested. With these points to guide us we know that the arrest of the disease and nutritious support are our great aim. To succeed in this I have adopted a respirator made of the ordinary shape and size, the front being minutely perforated. Inside of the respirator I have two or three perforated plates inserted, between which I place common tow (not cotton wool); I then drop on each of the layers of tow ten to twenty drops of a solution of carbolic acid, creosote, and glycerine. Should the patient tire of these, I use turpentine or iodine. I place the respirator over the mouth, and keep it continually applied. My next idea is to provide the patient with warm moist air. To do this I have two kettles of water kept boiling on the fire; attached to the spouts of the kettles I have an elastic tube of an inch caliber, at the end of which is a spray-like nozzle, which I put immediately under the mouth of the patient. By this means I get my disinfectant remedies carried moist to the throat. As a sedative to the pain I know nothing so comfortable to the patient. Previous to this I take care to give an active purge, which usually removes offensive stools of effete, poisonous matter. Internally I give aconite in frequent small doses—two to four minims of the tincture; at the same time freely supporting the strength with milk, cream, and eggs, with or without brandy, and beef tea *ad libitum*. As a drink I recommend patients to take as much chlorate of potash in solution as they can without vomiting. I have found chlorate of potash highly beneficial in all cases of a low typhoid character. If this is objected to, I advise the juice of lemon to be taken—by many thought to be a specific for diphtheria. Should the system be very weak, I prescribe belladonna instead of aconite; but I find better results from the latter. As soon as the urgent symptoms have subsided I order strychnia, with or without nitro-hydrochloric acid—this not only being the best tonic, but also preventing the paralysis which so often follows diphtheria. I have found this treatment to be highly beneficial, but, knowing the tendency there is to rheumatism after this terrible disease, I never forget our friend the bicarbonate of potash."

Zymotic Contagion.

Professor Tyndall asserts that diseases are propagated not by effluvia or sewer gas, but by solid particles discharged into the atmosphere by currents of air or gas. This he proved by the following experiment: He cut up a piece of steak, steeped in water, heated it at a little above the temperature of the blood, then strained off the liquid; in a short time this fluid became turbid, and when examined through a microscope was found to be swarming with living organisms; by the application of heat these were killed, and when the solution was filtered he obtained a perfectly pure liquid, which, if kept free from particles of dust, would remain pure for an unlimited period; but if a fly were to dip its leg in fluid containing living organisms and then into the pure liquid, the whole would be swarming with animalcula in forty-eight hours.

Table Salt an Aperient.

Physicians have for a long time known that common table salt is an efficient aperient in ordinary cases of constipation. In a lecture on a case of nervous affection, Dr. Weir Mitchell, of Philadelphia, said that he had recommended the patient to take each morning on rising a tumblerful of water—cold, to prevent nauseating—in which was dissolved a teaspoonful of table salt.

"This simple aperient," the doctor adds, "I frequently employ in cases of constipation, and generally find it efficient There is great advantage in starting the bowels and in keeping them in a soluble condition, particularly in cases of nervous disorder in women, as it sometimes clears up obscure points in the case, and at all events eliminates one source of error."

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.

☞ *The publishers of this paper guarantee to advertisers a circulation of not less than 50,000 copies every weekly 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 this office. Price 10 cents each.

(1) A. D. writes: 1. The cistern water we have here, when tested with the permanganate of potassa (distilled water solution), is of a brick dust color instead of a rose color. What is the cause of this? Is it due to the tinned roof or to the cement of the cistern? A. Probably the latter. 2. Do you know any method of restoring the red color which has faded on my Russian leather portmanteau? A. No.

(2) C. B. asks for a recipe for making a composition that would be hard enough to make pool balls, that would not be expensive, and also a recipe for coloring. A. Melt together over a gentle fire in an iron pot: pitch, 1 part; guttapercha, 2 parts; orange shellac, 5 parts; add to this 6 parts of white lead (lead carbonate) in impalpable powder, and stir until a perfectly homogeneous mixture is obtained; then cast and turn out. Color with the aniline dyes mixed with dilute alcoholic solution of bleached shellac.

(3) G. R. asks how to blue gun barrels. A. This is best done by submitting the barrel to heat until the required color is secured; but it may be done in a manner by applying to the barrel a little nitric acid, and allowing it to act upon the iron until a blue film appears, then wash the barrel thoroughly and oil it.

(4) J. G. asks: 1. Is there an ink that will dry quickly, or if there is not, can there be one compounded that will dry quickly, and print as nicely as that used in printing bank notes? A. Try the following: Shellac, 6 ounces; borax, 1 ounce; water, q. s.: boil together until perfect solution is effected, and triturate with this enough good iron black or nigrosin, to produce the desired color. A little alcohol will make the liquid flow more readily and dry quicker, but an excess must be avoided. 2. Please explain the principle of the steam injector? A. For a full explanation of the injector, see p. 99, Vol. 40, of SCIENTIFIC AMERICAN.

(5) E. P. M. asks: What would be the proper distance to place a bell from the ground, in order to convey its sound the greatest distance? A. A bell should be placed well above surrounding buildings, and if possible above trees. This subject is fully treated on p. 299 of current volume of SCIENTIFIC AMERICAN.

(6) P. B. asks: 1. What should I use to give a white and smooth surface to statues of plaster of Paris, after coming from the mould? A. Warm the cast and suspend it in melted white wax. The operation should be repeated until the wax is no longer absorbed. It is then allowed to become perfectly cool, when it may be polished. 2. How long should plaster of Paris be mixed with water before casting into the mould? A. Sprinkle the plaster into the water with which it is to be mixed. As soon as it settles to the bottom pour off most of the water, stir the mixture, and pour it immediately. 3. Please state what kind of stuff is used to make the plaster figures have a yellow tint (straw color)? A. Mix a little finely ground yellow ocher with the plaster, or stain the dry cast with a tincture of annatto or turmeric.

(7) "Woodworker" asks: Is there any danger of explosion from fire coming in contact with the fine dust of poplar and hard wood, blown through a Sturtevant blower into a shaving receiver or room? Can you give an instance of explosion of fine wood dust? A. There was an explosion of fine wood dust in the Pullman Palace Car Works in Detroit, Mich., a few years since. It occurred under about the same circumstances as you describe.

(8) C. F. C. asks what is the equivalent of a horse power. A. 33,000 lb. raised one foot high per minute.

(9) C. R. P. asks: Can you give us a substitute for alcohol for heating shoemakers' tools? It must heat well and not smoke the iron. A. There are several heaters in market using kerosene as fuel.

(10) W. W. S. asks: Is a building roofed with tin, corrugated iron, or other metal covering, less liable to be struck by lightning than if shingled, and if so, why? A. A building roofed with tin is not less liable to be struck by lightning than a shingle roofed building. If neither house were provided with a lightning rod, the tin roofed building, if struck, would be the safer, because the lightning would be likely to divide and spread over the metal, and find its way to the earth by several different paths on the exterior of the building, water leaders, gutters, etc. The wooden roof offers no such facility as metal for the spread or division of the electric charge, but is apt to tear its way through the building to the ground in one path.

(11) S. H. writes: 1. I have a spring which has 20 feet fall, with 500 feet of ¾ inch pipe running to my house; how much pressure have I? A. 9 lb. per square inch nearly. 2. Will it run a 6 gallon churn, and what kind of a wheel would be best? A. Address makers of water motors who advertise in our columns.

(12) O. J. H. asks: 1. Will the painting of wrought iron steam pipes with one coat of asphaltum varnish diminish permanently the heat-radiating power of such pipes. A. No. 2. Is there any other painting material preferable to asphaltum varnish for the purpose of giving the steam pipes a better appearance and making it easier to keep them clean? A. No. 3. Considering only the economy in fuel consumed for heating by steam, would it be advisable to use no paint of any kind at all? A. All radiating surfaces should have a dark color. Paint will do no harm provided it is dark and not too thick.

(13) J. A. M. asks how to calculate the proper thickness for cast iron head for wrought iron boiler, 36 inches diameter, 75 lb. pressure per inch. I fail to find it in Haswell or any other work of that kind which I have. A. You will find rules in "Wilson on Steam Boilers." In practice the thickness is more the result of experience than calculation, as much allowance must be made for possible defects in casting; the usual thickness is 1⅛ inch to 1¼ inch.

(14) J. N. H. asks: Are graphite, plumbago, and blacklead one and the same thing? A. Yes.

(15) D. R. asks for a method by which to deodorize some pistachio nut hair oil, held by me in bulk, bought in London in 1872. There is only about a quart left, but it has become rancid, and can undoubtedly be deodorized. A. Try the following: agitate the warm oil with about one per cent each of caustic lime and calcium sulphite (sulphite of lime) in powder, defecate, and draw off the clear oil. Repeat the treatment, if necessary.

(16) H. W. writes: I am melting a great deal of pig tin and lead, and soon accumulate a large pile of oxide and dross. Can you give me any information in regard to a proper furnace for smelting this dross, so as to recover the metal in a shape for reusing? A. The metal cannot be recovered from the dross in the way suggested. This dross, which consists chiefly of a mixture of tin oxide and finely divided metal, is usually calcined and sold in this condition as putty powder. The metal can be recovered from the dross by mixing the latter with, say, one third its weight of fine coke or charcoal, and heating the mixture in large luted crucibles gradually to full redness. The reduced metal remaining with the unconsumed carbon may be separated by pounding the mass and sifting out the carbonaceous matters, and remelting the granular metal at a low heat.

(17) F. A. B. asks for the receipt for making what are called Chinese rods, and which upon being burnt diffuse a delightful odor. A. 1. Gum benzoin, 6 parts; balsam of tolu and powdered sandal wood, each 4 parts; powdered tragacanth and labdanum, each 1 part; powdered niter and gum arabic, each 2 parts; cinnamon, 12 parts; light charcoal (linden), 48 parts. Form into a smooth ductile mass by aid of heat, mould and cool. 2. Gum benzoin, olibanum, and storax (tears), each 12 oz.; niter, 9 oz.; charcoal, 4 lb.; moistened with solution of 2 oz. tragacanth in a quart of rose water. To this may be added, if desired, essence of roses, pure neroli or orange powder, 1 oz. Oils of cloves and nutmeg, essence of vanilla, cascarilla, etc., are sometimes added in addition to the foregoing.

(18) G. L. D. asks: What is the greatest depth the sea has been sounded—actual, not supposed? A. 4,655 fathoms by Commodore Belknap, U. S. N., and 4,575 fathoms by the Challenger (English) expedition.

(19) P. C. B. asks: 1. How can eggs be preserved so as to keep good for the winter? A. Pack the eggs in a brine consisting of a saturated solution of salt in lime and water. The lime water is prepared by agitating soft water with enough lime to impart to it a milkiness, allowing this to settle in a covered vessel, and drawing off the clear lime water. 2. How can apples best be kept good from fall to the winter and spring? A. The apples to be preserved should be selected with due regard to their time of ripening. A Rhode Island greening, for instance, which ripens in January, can by the following method be preserved in good flavor until March or April, but not longer, whereas a northern spy, golden, or Princess Russell, or any late ripening variety, can be preserved in full flavor until the following August or September, though they must be promptly used after opening. The method of preserving the fruit is as follows: Select only perfect fruit, envelope each tightly in two separate wrappings of any thin paper, pack them in clean firkins or air tight barrels, and head them in securely, air tight. Thus packed apples may be preserved in a perfectly sound condition for a year or more, though, as before remarked, if kept much beyond their regular time of ripening they will lose in flavor. 3. Which is the best way to preserve whole heads of cabbage so as to keep good in the winter and spring? A. Keep them in a dry place, in well aired barrels. 4. I have a copper ore which assays as follows: Copper, 63·76; iron, 10·50; sulphur, 25·37; gangue, 0·10; total, 99·93. The ore carries about 1 3-5 ounces gold per ton (=0·005 per cent) and some silver. How can I best and cheapest smelt it, say 75 or 100 lb. ore at a time? A. It will probably be necessary to chlorinize the ore and submit it to the amalgamation process. Consult Phillips' "Metallurgy of Gold and Silver."

(20) A. C. writes: I have been trying to make some varnish, but have failed so far, and want to know what is wrong. I put two ounces of bleached lac into a bottle, and covered with alcohol; it swelled, and I added alcohol till it filled a pint bottle. It is now a curdy mass with some fluid on the top of it. I warmed it and stirred without effect. What is the matter? A. Try 95 per cent alcohol.

(21) C. R. asks: Could I convey ground tan bark from the mill to leaches by means of a blower; if so, how should it be applied? A. The tan bark can be propelled by a blower if it is dry. If it is mixed with water, a centrifugal pump should be used. If you employ a blower, the bends in the pipe which conveys the tan bark should be of long radius.

(22) S. B. F. writes: We have a machinist that says a belt will slip less on a pulley that has not been turned than on a very smooth pulley. Is he correct? A. According to the experiments of Hoyt & Co., a belt will drive about 50 per cent more on a polished face iron pulley than on one with a rough face.

(23) A. E. F. asks: Why is it that the light side of the new moon appears larger to the naked eye than that portion made visible by the earth's light? The line of the moon's surface is seen in the bright position, corresponding in size to the outlines of the dark side. It being supposed that the moon has no atmosphere, how do the sun's rays produce this effect? A. The phenomenon observed by you is called irradiation. It is due to the fact that impressions of bright objects on the retina extend beyond the outline of the image. Irradiation differs in different people, and even in the same person it is different on different days. It also increases with the luminosity of the object. The electric light affords a marked example of this phenomenon. The source of light, which is scarcely more than a mere point, appears a miniature sun. An incandescent platinum wire looks many times larger than its actual size.

(24) A. B. C. asks for the best compound or simple substance with which to impregnate baked wood for insulators for telegraph lines. A. Plunge the wood for a few minutes in hot paraffine.

(25) E. H. S. asks: Is a telegraph wire a protection to a building if the wire is well insulated and has good ground connection? A. It might be a protection, but it would be very limited, as a telegraph wire of the usual size is not large enough to conduct a heavy lightning discharge.

(26) J. E. K. asks: 1. Does the density of the atmosphere affect the velocity of falling bodies? A. Yes. 2. To illustrate: Suppose a cup of water or oil to be suspended in the top of an air receiver in which there is a pressure of 60 lb. per square inch, if the cup was upset, would it require a longer time for the fluid to reach the bottom than it would if the air was of ordinary atmospheric density? A. It would.

(27) B. A. asks: Which is preferable for bolting foot blocks to joists, overhead—¾ bolts extending through block and joist with nut on end, or, ⅝ wood screws extending through block and into joist 6 or 8 inches, sound hemlock joists—*i. e.* I mean which would be the easier drawn down or out—joists 12 inches thick? A. Through bolts and nuts are to be preferred; but if you use wood screws they should be at least ⅛ inch larger than the bolts.

(28) B. F. T. asks: 1. How can I make a paint for crockery, etc., that hot water will not wash off? A. Porcelain (or white ware) may be painted in enamel, that is, the design painted in metallic oxides and burned in (see Spon's Practical Receipts). Any ordinary paint that can be applied will not stand much washing, especially if hot water and soap are used. 2. How can I paint on cloth without sizing it and not have the paint spread? A. It is necessary to use size, unless the cloth is waxed.

(29) G. E. W. asks: What mode of measurement do you get the tonnage of a ship? A. You will find rules for tonnage in "Haswell's Engineer's Pocket Book."

(30) S. A. S. asks: How can I clean rust from the iron plates of a hydraulic press, so as to leave the plates perfectly clean and free from chemical odors? A. Try dilute sulphuric acid, say 1 part of acid to 10 of water. Wash the plates thoroughly after the application of the acid.

(31) S. E. W. asks (1) if lump lime will slake in oil. I want it for painting a large ice house as an improvement on whitewash. A. The slaking of lime is due to the formation of a hydrate of lime—to which reaction water is essential. Lime may be made into an emulsion with oil, but this emulsion is very different from the hydrate formed by water. 2. Also please send me the number of your paper that contains a description for making rubber stamps. A. See p. 1226, No. 83, SCIENTIFIC AMERICAN SUPPLEMENT.

(32) M. B. S. B. writes: My engine cylinder is 3½ inches long by 1½ inches in diameter. What sized boiler do I require? A. Your boiler should have from 10 to 15 feet fire surface, according to the pressure you wish to carry and speed of engine.

(33) E. A. D. P. asks: 1. What is meant by aperture? Is it the diameter of the object glass, or the opening of the diaphragm in the eye piece? A. It is the diameter of the clear or exposed portion of the objective. 2. For an object glass of 2½ or 3 inches diameter, how many lenses, of what size, and how far apart (measured perpendicular to their plane sides), will form the best eyepiece for ordinary astronomical purposes? A. You do not give focal length of your objective. It is probable that the answer to J. W. S. (14), p. 408 of current volume, will assist you.

(34) L. P. B. writes: I desire to send a stream of oxygen through water. Please inform me how I may do the same? A. Pass a glass tube from the oxygen reservoir to the bottom of the vessel. When the gas is placed under a light pressure it will force its way through the liquid.

(35) C. R. M. writes: I have an 80 horse power boiler, carrying 65 lb. of steam, runs a 65 horse engine, also supplies jacketed kettles, coils in tanks for heating water, steam tables, etc.; they are all connected to a narrow steam trap that discharges into a tank. Near the tank I have a double connection, by which I can shut the water from the tank and catch it in a pail and weigh it. Now, how many pounds of water per hour discharged by said trap ought to constitute one horse power? Can you give me a standard and reliable rule? A. There is no rule which will apply; a fairly good steam engine will furnish one horse power by consumption of 23 lb. steam. We think you might assume 22 to 24 lb. water per horse power.

(36) A. P. asks: 1. What tension will ½ inch boiler stand? A. It depends upon the diameter of the boiler and quality of the iron. 2. At what density does sea water form a deposit? A. Deposits of lime will commence, say, at 1½ densities by salinometer, and of salt at about 2½ densities. 3. How far from the first row of tubes must the gauge cocks be? A. 3 to 4 inches. 4. How will salt and fresh water act when being mixed in boilers? A. The mixing will tend to make the water foam.

(37) F. W. D. asks how photographers prevent the disagreeable odor from collodion, etc., from becoming prominent? I cannot use it without scenting up all the surroundings. A. The odor cannot be diminished or cloaked; the annoyance is obviated by using the collodion only in a well ventilated closet.

(38) M. E. H. asks for the process of treating ships' sails so as to preserve them from mildew and decay. A. Saturate the fabric with a boiling solution of curd soap 3 lb., water 5 gallons. Press out excess of the solution between rolls, and digest for two hours or more in a solution of lead acetate 3 lb., water 2 gallons. Finally rinse well in water and dry rapidly without over-heating.

(39) H. K. & J. O B.—Ordinary so called washing fluid is prepared by warming together one part of washing soda (commercial carbonate of soda) and two parts of lime in about 30 parts of soft water, and after the suspended carbonate has entirely subsided decanting the clear liquid for use. Aqueous solutions of water glass, soap, starch, chlorinated soda, borax, etc., are often added in various proportions.

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

N. B.—No 1, feldspathic rock containing crystals of hornblende. No. 2, mica schist. Nos. 3 and 4, hornblende schist. No. 5, quartz and hornblende. No. 6, feldspar.—D. D. B.—Magnetite; if free from phosphorus and titanium an excellent iron ore.—A. S. T.—It is an impure ferruginous clay of little value.

[OFFICIAL.]

INDEX OF INVENTIONS

FOR WHICH

Letters Patent of the United States were Granted in the Week Ending

November 25, 1879,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

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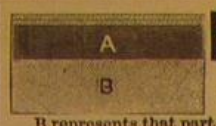

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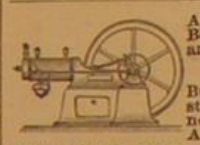

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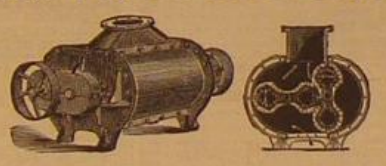

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