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Fig. 2.—SIDE VIEW OF MOTOR CYCLE, PARTLY IN SECTION.

Fig. 1.—DETAILS OF GERMAN MOTOR CYCLE USING BENZINE.—[See page 425.]

Scientific American.

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ACCOUNTINGS IN PATENT SUITS.

The procedure in suits for infringement of patents as brought in the federal courts is based usually on well defined and identical methods of procedure. The complaining party asks for an injunction restraining the alleged infringer from using the patented device, and in most cases asks that an accounting for profits be ordered. The injunction may be opposed by the defendant on various grounds. He may allege that his operations were outside of the scope of the patent, whose scope by citation of prior patents, constructions, and records he may attempt to limit. Or on citations of the same character he may attempt to prove the patent entirely invalid. Usually all such defenses are included in the action. The court reaches a decision after prolonged hearings before a special master and a final hearing in open court. The patent which runs the gauntlet of a well fought patent suit and comes out unscathed acquires a standing which adds greatly to the consideration which will be given it in subsequent actions. After a decision sustaining a patent has been made, an accounting for profits is usually ordered.

An accounting for profits is a proceeding which notoriously is of direct benefit to others than the parties to the suit. As usually conducted it is put in the hands of a master. The counsel in the case appear before him day after day and bring forward all kinds of evidence in support of the opposing claims. The complainant, victorious in the final hearing, calls to the stand any one conversant with the business to determine what advantage in dollars and cents is attributable to the use of the patent. The books of the concern sued, its officers, bookkeepers, and employes, may all be called to testify as to the business done. Opposing counsel argue constantly, object to the testimony, and make of the accounting a prolonged proceeding of question and answer in the line of direct and cross examination with constant objections and arguments before the master. Without attributing too much of the weakness of poor human nature to those who conduct the proceedings, one thing may be noted, the counsel and master are paid according to the amount of work done in the accounting. They have no selfish motive to induce them to try to reach a decision quickly. The absence of such a motive, as well as the reverse feature alluded to, act as a sort of inducement or temptation to prolong the accounting.

One of the most remarkable accountings on record was that carried on in the Webster-Higgins suit. Here an accounting was ordered in a case relating to improvements in the manufacture of carpet. Four years were consumed in bringing the case to a final hearing and then the accounting began. Over $28,000,000 damages were asked for. Years were devoted to the hearing in the accounting. The cross examination of one witness lasted over two years, and finally the damages appeared as $1,500,000. Eleven days were devoted to the argument, and a thousand pages of briefs were handed to the master in the accounting. The matter ended somewhat like the great chancery suit of Jarndyce vs. Jarndyce in Dickens' novel "Bleak House," the damages being eventually reduced to six cents so as to settle the placing of taxable costs. The lawers were the principal gainers.

The decision of the master in these cases is subject to the approval of the court, and very great damages may be set aside or reduced in proceedings, subsequent to the master's report. Thus, in a recent case reported in the Official Gazette, United States Patent Office, the master, as the result of the accounting, gave over $76,000 as the measure of profits due to infringement. In an elaborate decision the court reviews the case, and makes many interesting points, for whose discussion space is lacking here. It is enough to say that the court takes the matter into its own hands, considers the record, and states that it has been in doubt as to whether it should send the case to a master for a hearing. This would mean a long delay and a repetition of the agony, perhaps at greater length than before. The case had already been pending eighteen years, nine years of this before a master. It had actually survived two masters. The court hesitated to compel an additional expenditure of time, and concluded to ascertain from the record the amount of profits, which it put at $40,000. One of the points made was that the manufacture had ceased on the large scale, and, as the matter therefore referred to the past, estimates alone as to profits could be given. The decision is interesting, as affording an example of assignment of profits by the court. This meant expedition, for had the case gone again before a master, months or years would have been expended upon the determination of the question, settled at once by the court's decision.

In England at a recent meeting of the Society of Patent Agents the temptation to prolong patent suits was alluded to. The settlement of damages by the court in the case cited was certainly a move in the direction of acceleration, rather nullified in real good by the preceding eighteen years of delay.

The uses of an accounting as far as the parties to the suit are concerned are apt to be of the indirect order. It is sometimes made an instrument to enforce a compromise. The losing party, seeing months of expensive process before him, is willing to do anything to avoid it, although it may have possibilities in the way of reducing damages. This leads to compromises. Again, an accounting may be closed and a report may be given for an extravagant amount. This again is often the basis for a compromise, for the collection of the immense sums which accountings sometimes determine is apt to be difficult, and the moral effect of such findings is to dissuade infringement.

All this seems unethical and unsatisfactory, but it is hard to see how the objections of delay and expense attaching to these proceedings are to be overcome. The patent practice has been termed the metaphysics of the law, and the best judicial minds on the bench are constantly occupied in interpreting it. The difficulty of the questions which come before it justify the seeming delay. Again, in an accounting neither side is willing to lose a single point, and this desire induces the expenditure of much legal talent in the debating of points which at first sight would not seem likely to arise in an accounting for business profits.

A patent has to go through the courts when the time comes, and the long ordeal, if survived, gives it its value. Its value is affirmed by the proceedings while in progress. They are watched by those interested, and a strong upholding of the rights represented by the patent in suit gives it prestige and leads to its acknowledgment by others, while its status may yet be pending and awaiting determination. The profits from a patent do not come from accountings for profits, but from royalties. The accountings are often powerful inducements toward the payment of such royalties without contest.

PROFITABLE PHILANTHROPY IN THE HOUSING OF THE WORKING CLASSES.

George Peabody, the great American philanthropist, did noble work in the cause of humanity when he provided comfortable homes for the poorer classes of London and placed the rental at a figure which enabled these people to live in comfort and decency and yet feel that they were not in the least degree the objects of charity. This gentleman conceived the idea that if homes for the poorer paid of the working people were intelligently designed, well built, and economically managed, they could be let at greatly reduced rentals and yet yield a reasonable return upon their first cost. The experiment was tried and proved a brilliant success. As the result of the munificence of this one man, nearly thirty thousand of the working people of London are to-day housed amid comfortable and hygienic surroundings at rentals which make a comparatively small demand upon their incomes. All the increase on the capital is devoted to the extension of the enterprise, and so profitable has the undertaking proved, that the original sum has more than doubled from its own increment.

The success of the Peabody houses led to the establishment of model homes companies in many of the cities of Great Britain, and they have all been governed by the principle of adjusting the rentals to cover the necessary repairs of the dwellings, plus a moderate and reasonable interest upon the capital—usually from four to six per cent. The "Eighth Special Report of the Commissioner of Labor: The Housing of the Working People," recently issued by the federal government, in which is embodied the results of three years' close personal study of the question by the United States commissioner, shows that the model housing operations of the world in cities of 100,000 population and over are uniformly a financial success. Eighty-eight per cent of all these enterprises (almost all of them in Europe, where the earnings of capital are less than in America) steadily pay the prevailing commercial rate of interest (from four to six per cent) after putting the property in repair and providing a comfortable contingent fund; six per cent of these companies pay a savings bank rate of interest, and only six per cent can be called partial financial failures.

The above mentioned report comes in as a stinging rebuke to those people who declare that semi-philanthropic schemes for the better housing of the people are visionary and impracticable. It will be found that in many cases the objectors are a class of interested parties, who are determined to squeeze an 8 to 12 per cent interest out of their tenements, even if it does take twenty to thirty per cent of the hard earned and all too scanty wage of their tenants to make such a return.

The term successful, as applied to model tenement enterprise, is strictly relative, and depends upon the financial standard by which such schemes are judged. The parties who call model tenement house schemes a failure would no doubt consider the five per cent interest which they pay a miserably inadequate return upon capital, at least in this country. But it should be remembered that the thirty years which have intervened since the war have seen a steady decline in the rates of interest on every kind of investment, and while the five per cent interest guaranteed by such schemes as we are considering is less than that which capital can demand in certain choice forms of investment, it is questionable if it will much longer remain so.

It gives us much pleasure to note that the experiment which has proved so successful in Europe is to be given a trial by an influential and representative company in the city of New York. Some account of the City and Suburban Homes Company will be found in the current issue of the SCIENTIFIC AMERICAN SUPPLEMENT. It augurs well for the success of the scheme that Dr. Elgin R. L. Gould, who as United States commissioner spent three years in personal examination into the housing of the people in Europe, has been chosen president, and the list of officers and directors includes the names of many influential and wealthy citizens who have been distinguished for their practical philanthropy.

The first lot of city homes is to be built on a block of nineteen lots, which has been turned over to the company by the owner, Mrs. Alfred Corning Clark, on an appraised valuation in return for shares of its capital stock at par. This lady also makes a cash subscription to the capital stock of the company, which, together with the price of the land, will amount to half the value of the land and buildings when completed. We quote this case as showing that the wealthier members of the community, especially those who are owners of city real estate, have here an opportunity of investing capital at a fair return with humanitarian ends in view. In so doing they can at the same time prove to the less fortunate classes of society that they have a real sympathy with their difficulties, and a practical desire to express it, which will be a standing rebuke to those social agitators who deny that such sympathy ever exists.

THE MOTOR CAR IN ENGLAND.

The recent inaugural trip of motor cars from London to Brighton, England, in commemoration of the passing of the Light Locomotives Act, was an event in the history of transportation in that country second only in importance to the historic locomotive competition in the north of England nearly three-quarters of a century ago.

The almost complete monopoly of the development of the motor car which has hitherto been enjoyed by France was due, as far as Great Britain was concerned, to the existence of antiquated and vexatious legal restraints which prevented the use of self-propelled vehicles on highways except for heavy and slow traffic. Now that these restrictions are removed, it is reasonable to expect that a people who gave to the world the steam locomotive, and have been so largely responsible for its subsequent development, will also share largely in the future development of the motor car.

In saying that the advent of the horseless carriage, motor cycle, automobile car, or whatever it may eventually come to be named, is an event in the history of English transportation second only in importance to the birth of the locomotive, the statement is made with the knowledge that it will have its special field of operation and certain arbitrary limitations as clearly defined as those of the locomotive itself. Its sphere of usefulness will commence where that of the latter terminates. In the matter of through traffic between outlying districts that are not and are not likely to be served by any railway and the cities, its work will, of course, be strictly supplementary to that of the trunk railways themselves. But in serving as a feeder for the railways and as a means for transportation between scattered hamlets and villages, it is certain that, apart from its usefulness in city and suburban traffic, to which we refer later, the perfected motor car will become a factor in the general scheme of transportation as essential in its way as the railroads themselves.

It is probable that, apart from the artificial hindrances of legislation, the neglect into which the motor car fell was due to the invention of the iron rail, which vastly increased the hauling power of the locomotive as compared with that of the road carriage. For we must not forget that the steam carriage antedated the locomotive by fully half a century, and that it was largely the reduction of rolling friction by the use of a prepared iron track that caused the locomotive to become the recognized hauling machine of the day, and relegated the steam carriage to comparative obscurity.

The invention of the cushion and pneumatic tire, however, is now likely to do for the steam or motor carriage what the rails did for the locomotive. It has so reduced the rolling resistance on a first-class road that it compares favorably for its lighter loads with that of a steel tire on a steel rail; and now that this radical difficulty has been removed, it is reasonable to expect that a motor will eventually be produced as perfect in its way as a first-class modern locomotive.

With the development of the motor car there will be a simultaneous improvement in the condition of the roads. As the locomotive grew in weight and power there was a steady improvement in the condition of the track, for it was found that the capital which was put into the roadway was returned twice over in the hauling and earning power of the locomotive. The same causes will work out similar results on the common roads, and the policy will be carried out even to the extent of reducing grades, cutting out corners, improving the drainage and bringing up the surface of the highways to the highest possible perfection. The car and the roadway will thus react upon one another, the ever improving surface and level of the one increasing the hauling power and speed of the other. If our prediction is correct (and it is founded upon a reasonable analogy), the main highways of the country will be so modified as to conform to a ruling grade. Wherever this is at present exceeded the road will be graded down or swung around the hill until it comes within the maximum grade of that particular stretch of highway. By such a policy the effectiveness of the motor car will be vastly increased, whether for the farmer with his heavy loads of farm products or for the express, postal or private car with its higher speeds. The small cost per unit of the perfected motor car and its superior mobility will give it especial fitness for rural transportation, as compared with any system which involves the first cost and maintenance of a steel track, and this economy will be increasingly seen in proportion to the scarcity of the population or the poverty of the country.

When we turn from the country to the city the conditions are somewhat different, especially in the matter of competition. Here there is no unoccupied field, and the new method of transportation will be brought into active rivalry with the elevated and underground systems and the various cable, electric and horsecar lines. And yet the conditions are not so changed but what the greater mobility of the motor car will tell in its favor. Like the ordinary cab, it can pick up its passengers and land them in any desired locality. And even when it is placed on a regular route through the main thoroughfares of the city, its mobility will give it an advantage over railway cars, electric, cable, or otherwise, which will render it specially suited to such work. A motor car of the same length as the ordinary cable car would carry the same number of passengers, but would carry them at a considerably greater speed. This will be evident to any one who watches the course of traffic on a crowded thoroughfare like Broadway, New York, through which a double-track surface line is laid. The existence of a double line of cars moving on a fixed track and claiming the right of way over other vehicles is a hindrance to the even flow of traffic, for it both delays the traffic and is itself delayed. Let us suppose, by way of illustration, that the rails on Broadway have been removed, the street asphalted from curb to curb, and the cable cars transformed into motor cars, having the run of the full width of the street, and free to overtake and pass each other at will. It is certain that the whole volume of traffic would move with less interruption than at present, and that the cars themselves would make considerably faster time.

Of the incidental benefits to a city from the reign of the motor car (if it should ever come) it is scarcely necessary to speak. From a hygienic standpoint they would be many and valuable. The deafening rattle of hard tires over Belgian blocks would give place to the silence of the pneumatic or cushion tired wheel; and its streets would be largely rid of the ever present filth which the thousands of horses now upon its streets involve.

The various motor car races which have taken place in this country and in France, and the recent inaugural trip from London to Brighton, have served to show both the powers and the limitations of the new motor. It is evident that any desirable speed can be gained if the strength and carrying power, and, therefore, the utility of the machines be sacrificed. The delays and breakdowns show that the average motor car is far from a perfect machine; and doubtless the car of the future will be as great an advance upon those which are now on the road as the bicycle of to-day is over that of a dozen years ago. There will have to be a large expenditure of brains and capital before a swift weight-carrying machine, which can do its work day in, day out, in city or country, is put upon the market; and we say this without any disparagement of certain lighter machines which are doing good work both in this country and Europe to-day.

The most promising feature of the situation is that the two greatest mechanical nations on earth, the American and the English, are only now taking hold of the problem in serious earnestness; and we doubt not that when they have once earnestly bent their energies to the task, the two races which have given to the world the railroad and the steamship will soon develop all the "Promise and Potentiality" of the motor car.

Examination of Cathode and Roentgen X Rays Through Colored Screens.

Mr. John Carbutt, of Philadelphia, says on this interesting subject, first: The cathode rays in an excited Crookes tube viewed through a pale yellow screen show increased brightness of the yellow rays; second, viewed through a dark violet screen, the cathode rays present a phosphorescent glow, similar to that in a low volt lamp when held in the field of an induction coil; third, viewed through a green screen, the cathode rays present to the eye a light emerald green; fourth, viewed through a dark red screen, the cathode rays present a pale red, on the carmine tint.

The screens are of thin polished plate glass 1⅛ mm. thick, coated with gelatine, colored with aniline dyes such as are used in preparing chromic screens for the camera.

Examination of Roentgen rays through plain glass and the previously mentioned screens shows that both cut off or absorb fully 50 per cent of the Roentgen rays from reaching the screen of the fluoroscope. Screens of the following colors were placed side by side with the clear glass, viz., dark violet, green, light yellow and dark red, and, when in juxtaposition, it was impossible to recognize which was clear glass and which was colored, and the eye was unable to detect any color sensation when looking through the fluoroscope with the colored screens in close contact. These experiments confirm the opinion he has held since his first dealing with the Roentgen X rays, that they are of the ultra violet, because he noticed they absorbed the entire spectrum, while a deep violet screen absorbs all but the red.

It was early determined by Prof. Roentgen that the X rays could neither be deflected nor refracted, but he is not aware of any experiments having been made to determine the absorptive powers by the X rays of the colors of the spectrum.

Benjamin Apthorp Gould.

Benjamin Apthorp Gould, the astronomer, died on November 27 at his home in Cambridge, Mass., from the effects of a fall received a few hours before. He was born in Boston on September 27, 1824. His father was Benjamin Apthorp Gould, famous as an educator. The son prepared for college at the Boston Latin School and graduated from Harvard in 1844. For a year he taught at the Roxbury Latin School, and then resigned to continue his studies in Europe. Astronomy was his favorite study. He followed this under Carl F. Gauss, in Goettingen, and in 1848 he got the degree of Ph.S. Later he studied under François Arago, in Paris, and he formed the acquaintance of the most noted scientists of the day. When he returned to the United States he started an astronomical journal. He continued the publication of this for twelve years, when he married Mary Apthorp Quincy. While he was an editor Mr. Gould did his first work for the government. In 1851 he took charge of the longitudinal operations of the coast survey. He was one of the first to use the telegraph in determining differences in longitude. In 1855 he organized the Dudley Observatory at Albany, and then it was that the normal clock, protected from atmospheric variations and furnished with barometric compensation, was first used.

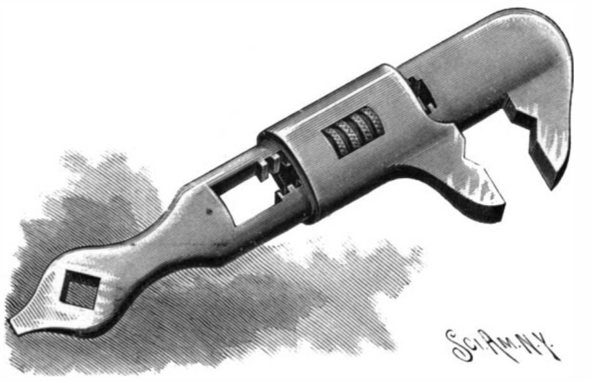
In 1866 he established in Valentia, Ireland, the station from which the difference in longitude between Europe and America was ascertained, and he connected the two continents by precise observations. These were the first determinations of transatlantic longitude by telegraph, and were the means of establishing a connected series of longitude measurements from the Ural Mountains to New Orleans. In 1868 he organized the National Observatory of the Argentine Republic in Cordoba. His work there included the mapping of a large portion of the southern heavens. His work, "Uranometry of the Southern Heavens," is accepted to-day as the final authority for the southern hemisphere. In 1885, when he returned to the United States, Prof. Gould re-established his astronomical paper. In addition to his astronomical work Prof. Gould wrote for the government a work containing the result of his observations on 30,000 men from the point of view of statistical anthropology. He was a member of the Royal Astronomical Society of London, of the French Academy of Science, of the Academy of St. Petersburg, of the American Academy of Science, and other similar societies.

The Universal Postal Congress.

The next universal postal congress will assemble in Washington in May, 1897. Invitations will be sent to all countries having mail arrangements. The sessions will last two months, and the debates will be conducted in French. China and the Orange Free State are the only countries of importance that do not belong to the Universal Postal Union; they will however probably send delegates. The vital question before the congress will be that of payment by one country for the transportation of its mails across the domains of every other. Every grain of weight of mail matter sent by one country across the land or water of another is now scrupulously paid for to its destination. The settlement of the rate of payment causes a vast deal of vexatious work. The payment is made on the basis of statistics taken once in three years, covering a period of four weeks. Every country then weighs all mails it dispatches to every point outside its limits, and the countries to which the mails are respectively addressed verify the figures. But the system gives rise to so many complications and annoyances that it is proposed to do away with it altogether. Some countries, among them the United States, seek the total abolishment of these transit rates and the substitution of an arrangement by which each country carries the mails of all others free.

AN IMPROVED WRENCH.

The illustration represents a strong, simple and inexpensive wrench, in which the movable jaw may be readily and quickly adjusted as desired. The improvement has been patented by Walter C. Stokes, of No. 66 Broadway, New York City. The two jaws have recesses adapted to receive a portion of two sides of a hexagonal or polygonal nut, an ordinary or square nut being received between the flat surfaces of the jaws. The body of the wrench has a longitudinal threaded slot, terminating in an enlarged outer portion, and the sleeve carrying the movable jaw fits somewhat snugly to the body, and is moved by an adjusting nut having an exterior thread entering the side threads in the slot, there being a slot about centrally in each side of the sleeve.



STOKES' WRENCH.

The adjusting nut is placed in position by moving the sleeve outward until the slot in the sleeve is opposite the larger outer portion of the slot in the wrench handle. In the outer end of the handle are one or more rectangular openings to receive a nut, and the handle end terminates in a screwdriver. By giving the body and sleeve an ovate cross section, it is designed to provide a wrench having the greatest possible strength without being heavy or cumbersome.

A RENAISSANCE WOOD CARVING.

In most periods of art development, sculpture led the plastic arts as regards time, and the Renaissance was no exception to the rule. The medium employed was stone, bronze or wood, according to the special use to which the object was to be put. Wood has always been considered as especially adapted for certain classes of work, though it has of course a relatively short life, all vegetable substances having deterioration as their first law, operative from the moment they leave the forest or field. Still, with the exercise of proper care, works executed in wood can be preserved for hundreds, even thousands of years, the best example being, perhaps, the famous portrait statue in the museum of Boulak, Egypt, which dates from 4000 years B. C. The old sculptors were quick to see that wood, with its structure of long fibers, strong in one direction and weak in another, was especially adapted for surface carving and small works. Large curves were avoided, on account of the tendency to split, and undercutting was eschewed as much as possible; still statues in the round were made during the middle ages and the Renaissance, and a large number of excellent works have come down to us. These were largely executed for church purposes, and include crucifixes, rood screens, confessionals, choir stalls, etc. Even Donatello and Brunelleschi, the giants of the early or first Renaissance, did not disdain to execute works in the round, in wood. The fine examples of wood carving are endless; they are found in Italy, Spain, France, Germany, England, Belgium and Holland. The lovely surface carving of the time of Raphael, when attention was first paid to the newly discovered remains of Roman wall painting, the so-called "grotesques," afford some of the most charming examples of an antique motive turned to account for modern use. The rich German "tabernacle work" so much used on altars still affords excellent material for study and imitation. Figures, sometimes life size, were frequently introduced into the composition, and some of the grand scroll work has never been surpassed. France, with her Jean Goujon and other masters of the chisel, produced very beautiful works. England used wood carving extensively for church work for recumbent effigies on tombs, and the richly carved timber roofs are especially noteworthy.

To-day Belgium contains some splendid examples of artistic woodwork, one of which is shown in our engraving. This specimen is interesting largely on account of the difficult nature of the work, owing to its large size and the superb technique which is shown. This confessional is in the church of St. Paul, at Antwerp; it is a late Gothic edifice, built 1540-1571. The church contains fine Renaissance choir stalls and the confessionals, one of which is shown in our engraving. The frieze is, perhaps, the purest part of the work, but the naive cherubs who sit at the right and left of Christ are charming. It will be seen that the four figures are of large size. The wood carving in this church is one of the sights of Antwerp.

A RENAISSANCE WOOD CARVING IN ANTWERP.

Speed of Trolley Cars.

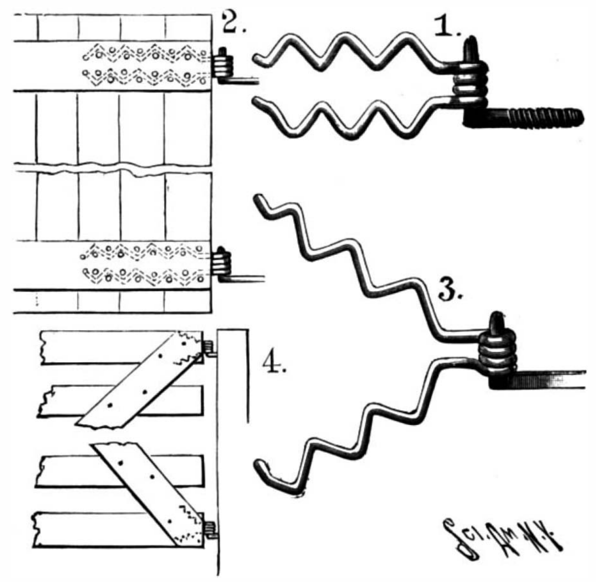
How to calculate the speed of a trolley car is an interesting problem to any one in the business who happens to be riding faster or slower than he is accustomed. It also has a fascination to the passenger with an inquiring mind. Various ways have been suggested, but the simplest is to note the number of feet the car goes a minute and divide by 88, which will give you the number of miles an hour, or rate of speed. A car moving at the rate of 1 mile an hour will pass over 88 feet a minute. A speed of 176 feet a minute is at the rate of 2 miles an hour; 352 feet, 4 miles; 528 feet, 6 miles; 704 feet, 8 miles; 880 feet, 10 miles; 1,320 feet, 15 miles; 1,760 feet, 20 miles; 2,200 feet, 25 miles; 2,640 feet, 30 miles; 3,520 feet, 40 miles; 4,400 feet, 50 miles; 5,280 feet, 60 miles. If poles are set regularly at equal distances, it is easy to calculate the distance the car goes in a given time.

A rather complicated method is based upon the purring sound caused by the meshing of the gear and pinion teeth. In order to calculate by this plan, it is necessary to carry along a tuning fork or a seven octave piano. If the tone is the same pitch as "middle C," which makes 264 vibrations a second, the teeth are meshing at the rate of 264 a second. If the number of teeth on the gear is known, together with the diameter of the car wheel, the rate of speed can be ascertained.

The number of 30 foot rail lengths passed over in 20 seconds will give the speed in miles per hour approximately.

A CHEAP AND EFFICIENT HINGE.

The illustration represents a hinge made of a piece of stout wire, and well adapted for use on any cheap gate, or on a door having battens which may inclose the corrugated shanks diverging from the eye of the hinge. The improvement has been patented by Tyree Rodes, of Cedar Hill, Tenn. The figures show different forms of the hinge and how it is applied, the wire being bent



RODES' HINGE.

upon itself to form an eye or knuckle, in which the wire is closely coiled upon itself, while the body members have a corrugated or serpentine form, with angular spurs at the ends. The two members are located between the slats, cross bars or braces of a gate, or are inclosed by the battens of a door, the means employed for securing the parts together also holding the members of the hinge in place, while the eye or knuckle extends outward and receives the ordinary knuckle pin attached to the swing post, or equivalent device in a door casing.

"Pole" Paper.

What is called "pole" paper is paper saturated with a substance that is sensitive to the action of the electric current and that permits of instantly distinguishing the positive from the negative pole in an open circuit. According to the Annales de Chimie Analytique, this paper is prepared as follows:

From 1 to 2 grammes of phtalein of phenol are dissolved in 10 cubic centimeters of 90° alcohol. The solution is poured into a glass vessel and about 110 cubic centimeters of distilled water are added to it. The result is a milky emulsion of phtalein.

On another hand, 20 grammes of sulphate of soda are dissolved in about 100 cubic centimeters of distilled water.

The first solution is poured into a porcelain tray, and several sheets of slightly porous paper are dipped into it one after another. These sheets, after being allowed to drain, are immersed, while still damp, in the soda solution.

The paper, after being dried, is extremely sensitive to the action of the electric current. In order to ascertain the direction of a current, a piece of the paper is dampened and the extremities of the two copper conductors are applied to it in such a way as to leave a space of about half an inch or an inch between them. One of the wires instantly produces upon the paper a deep red line, which is due to the action of the soda set at liberty, and which extends toward the negative pole upon the phtalein. The other wire remains inactive.

BENZINE MOTOR CYCLE.

One is apt to feel that the railway locomotive is a magazine of power, an annihilator of distance, an embodiment of energy and altogether a marvelous production which commands respect almost as if it were a thing possessed of life and intelligence. Recently a locomotive has been devised for the use of the individual, which is no less interesting than the railway locomotive. It combines the peculiarities of the bicycle and the locomotive, and forms a new species of machine known as the motor cycle.

The particular machine which we illustrate was made in Munich, Bavaria. It was used in Germany by Mr. Henry Hirsch, of the SCIENTIFIC AMERICAN corps, and was by him brought to this country. It has been run over the ample floors of this office, much to the interest and amusement of the employes and visitors who chanced to be present at the time.

We have made an elaborate set of illustrations on account of the novelty of the machine, as well as the interest attached to the motor, aside from its connection with the bicycle.

In Fig. 1 the machine is shown in actual use.

Fig. 2 is a side view, partly in section.

Fig. 3 is an enlarged perspective view of a portion of one of the cylinders, showing the valve motion.

Fig. 4 is a sectional view of the benzine reservoir.

Fig. 5 is a view of the igniting apparatus, with parts broken away to show the internal construction.

Fig. 6 is a detail view of one of the ignition tubes.

Fig. 7 shows the valve controller.

The frame of the machine is formed of four parallel tubes, two upon either side, connected with the main journal boxes of the rear or drive wheel, and united at their forward ends with two pairs of oblique tubes connected by cross bars at the top, and carrying the steering head, in which is received the shank of the front fork, as in an ordinary bicycle.

Between the two pairs of horizontal bars are secured two motor cylinders, formed in one casting and provided with a water jacket. The cylinders contain pistons connected by piston rods with the crank on the main shaft. The bearings of the crank pins, as well as the bearings of the main shaft, are rendered nearly frictionless by the use of balls, as in the bearings of an ordinary bicycle. The cylinders are single acting, and the cranks, which are on opposite sides of the rear wheel, are parallel, and extend in the same direction. The engines work on the four cycle principle, and are so timed as to give one effective impulse for each revolution of the drive wheel.

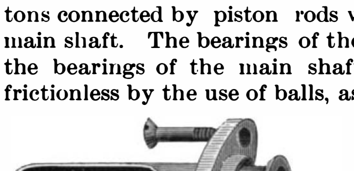


Fig. 6.—ONE OF THE IGNITING TUBES.

On the top of the cylinder, above the explosion chamber at the rear of the piston, is a valve chest containing two pairs of poppet valves, one pair to each cylinder. The valve chest is furnished with two separate chambers, one for the supply of the explosive mixture, the other for the escape of the exhaust, and the valves are held to their seats by spiral springs surrounding their stems, as shown. The valves which admit the explosive mixture are provided with light springs, so that when the pistons move forward the valves open inward automatically; but the exhaust valves are furnished with heavier springs, which hold them to their seats at all times except when they are depressed by the valve operating levers, A, A'.

These levers are made to open their respective valves in alternation by the peculiar combination of levers shown more clearly in Fig. 3. Upon the side of the rear or drive wheel is secured a cam, B, upon which presses a roller, a, carried by the arm, b, jointed to the lower side bar. A rod connected with the arm, b, is jointed to one end of the lever, C, the opposite end of which carries the hook, D. To the hook, D, is pivoted a three-armed lever, E, which is held in frictional contact with the hook by a strong spiral spring.

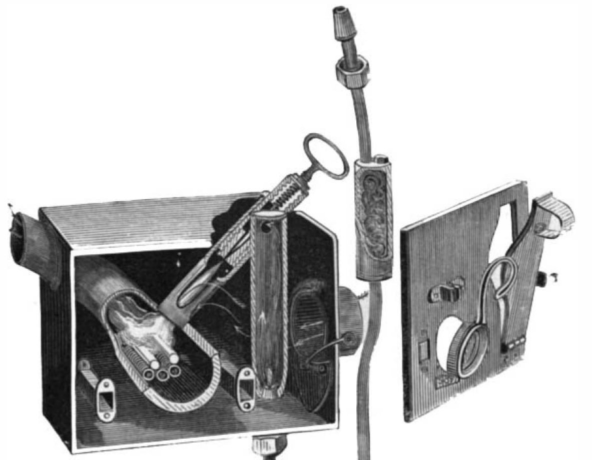


Fig. 5.-IGNITING APPARATUS.

Pivoted to the top of the cylinders are two arms, c, c', which are pressed toward the center of the cylinder by springs. The forward projecting arm of the lever, E, is capable of bearing against the free end of one or the other of the arms, c, c'. The shorter arms of the lever, E, are alternately brought into engagement with studs, d, d', projecting from the top of the cylinders. The angled arms, A, A', are pivoted on a rod supported by ears projecting from the cylinders, and their downwardly projecting ends are engaged in alternation by the hook, D. This action of the exhaust mechanism controls the machine.

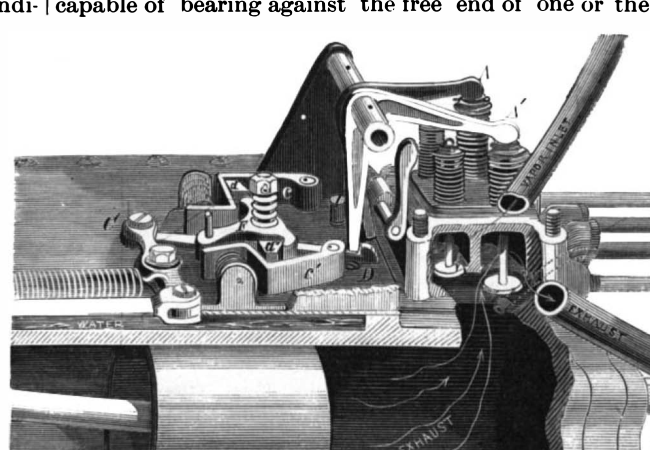


Fig. 3.—VALVE MOTION OF MOTOR CYCLE.

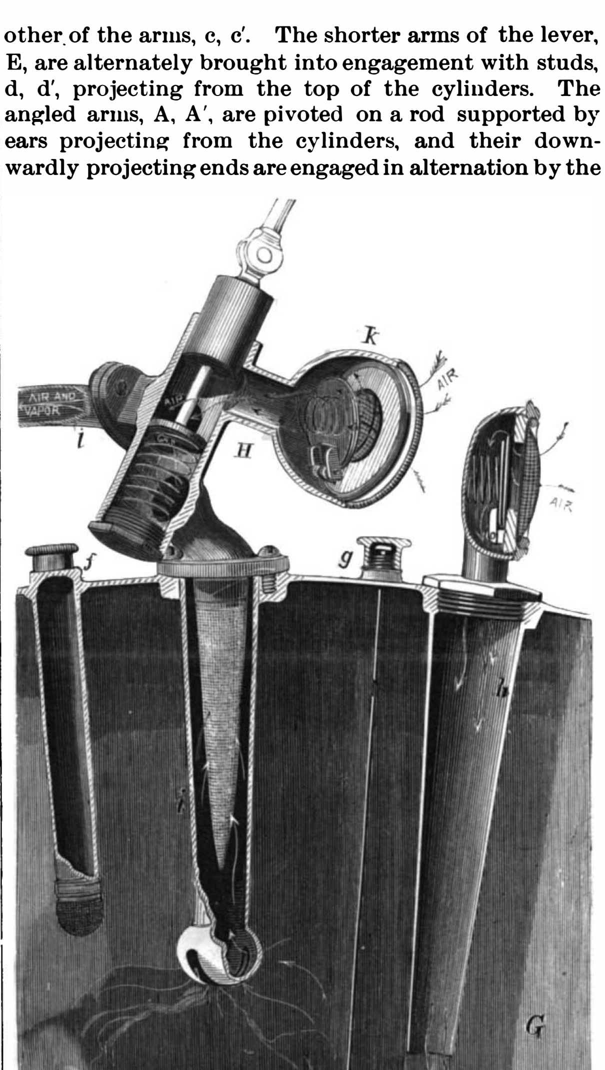


Fig. 4.—BENZINE RESERVOIR.

The ignition of the charge is effected by heating the nickel tubes projecting about 2½ inches from the rear ends of the cylinders into the ignition box. In this box is placed a heating vapor burner, receiving its vapor from the vertical tube at the side of the box, which contains a wick saturated with benzine supplied from the reservoir. The tubes extend into a fireclay chamber, in which are loosely placed three nickel spirals below the tubes, for distributing and retaining the heat. The heating burner, arranged in this way, effectively heats both nickel tubes, thus insuring prompt and regular explosions. The ignition tube is provided at its inner end with a flange which is clamped in place by a yoke, shown in Fig. 6. The lower oblique tube on one side of the machine conveys air to the burner, and the oblique tube on the other side serves as a chimney for carrying the products of combustion from the burner. These tubes terminate in a comparted hood, F.

The benzine is contained in the reservoir, G, supported by the oblique tubes at the front of the machine. This reservoir is connected directly by the small pipe, e, with the burner which heats the ignition tube. In the top of the reservoir, G, is inserted a screw-capped filling tube, f, the lower end of which is covered with wire gauze. To the top is attached a screw-capped nipple, g, through which extends a wire having on its lower end a cork float, by means of which the depth of the liquid in the reservoir is ascertained.

A conical air supply tube, h, projects into the reservoir and is provided at the top with a hood through which air enters into the reservoir. This hood is furnished with a check valve which keeps the tube closed except when a partial vacuum is formed through the action of the engine. The tube, i, projects into the reservoir and is provided with a hollow spherical lower end in which is formed a transverse slot. In this tube is inserted a wire or gauze cone connected at the top to the regulating valve, H, which latter also communicates with an air supply valve, k. The regulating valve, which is thin, is arranged to slide over the opening which communicates through the pipe, l, with the supply side of the valve casing. The proportion of benzine vapor and air conveyed to the engine depends upon the position of the valve, H, and this is regulated by the lever, m, pivoted to the handle bar and connected with the valve, H, by a rod. The lever, m, at its free end has a latch which is arranged to pass under a lug projecting from the handle bar when the valve is closed, and when the lever is released to open the valve, the regulating cone screwing on the end of the lever rests against a finger projecting from the handle bar, and serves to adjust the position of the valve by engagement with the finger as it is screwed along the threaded end of the lever.

The exhaust escaping through the exhaust valve is taken to a hood, I, made in the form of a hollow quarter cylinder, which is divided into two compartments by a perforated curved partition. The exhaust pipe enters into the smaller compartment and the larger compartment is filled with asbestos cord. The convex surface of the hood, I, is perforated. The asbestos cord serves as a muffler which deadens the noise of the exhaust.

Over the drive wheel is supported a curved water tank which is connected with the water jacket surrounding the cylinders, and the circulation of water serves to prevent the overheating of the cylinders. Strong elastic bands are connected with the connecting rod and with an arm mounted on a rock shaft at the top of the cylinder. These elastic bands may be put under tension to assist in starting by means of a screw at the top of the frame, which is operated by a crank and miter gear. The oil for the lubrication of the cylinders is contained in the upper oblique tube of the frame, and is fed to the cylinders by a sight feed, o.

To start the motor cycle, the reservoir, G, is partly filled with benzine or gasoline; the door at the back of the ignition box is opened and the burner for heating the ignition tube is started by giving it a preliminary heating by means of an alcohol torch. As the door at the rear of the ignition box is opened for this purpose, the air supply pipe is closed automatically by means of a connection with the rear door. When the tubes are red hot the valve, H, is opened, the rubber bands are put under tension and the machine is moved forward by the operator until an explosion occurs, when he mounts the machine and proceeds on his way. The proportion of the supply of air charged with petroleum vapor and pure air is regulated by the valve, H. By manipulating the cone on the lever, m, the supply of explosive mixture, and, consequently, the speed of the machine, is regulated. When the machine is fairly under way, the tension of the rubber bands is released.

The action of the machine is as follows:

The forward motion of the piston draws in the explosive mixture through the valve, H, as already described. On its return, it compresses the explosive mixture in the explosion chamber behind the piston, and a portion of the mixture is forced into the hot tube, where it is ignited, forcing the piston outwardly, giving the propelling impulse. The return stroke of the piston expels the products of combustion through the exhaust valve, which is opened by the cam, B, at the proper moment through the agency of the roller, a, and the hook, D, as already described, and the cylinders operate in alternation, thereby giving one effective impulse for each revolution of the drive wheel. To stop

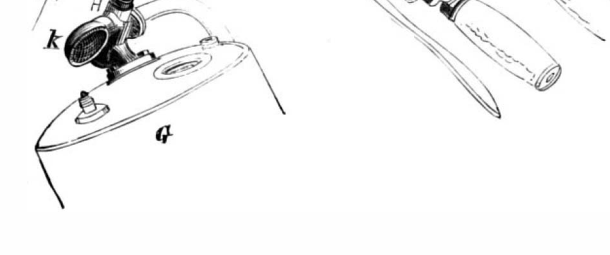


Fig. 7—VALVE CONTROLLER.

the machine, it is only necessary to close the valve, H, and apply the brake in the usual way.

The engine cylinders are $3\frac{9}{16}$ inches in diameter, with a stroke of $4\frac{5}{8}$ inches. The supply and exhaust valve apertures are $\frac{1}{2}$ inch in diameter. The benzine reservoir is 13 inches long and $7\frac{1}{2}$ inches in diameter. The driving wheel is 22 inches in diameter and the guiding wheel is 26 inches in diameter. The pneumatic tires are made specially large and heavy to support the weight of the machine and rider. The tread of the machine is 4 feet; weight when in running order, 115 pounds.

The reservoir contains a supply of benzine sufficient for a run of 12 hours. The machine is able to run at a speed of from 3 to 24 miles per hour.*

MODERN APPLICATIONS OF THE STORAGE BATTERY.

BY WILLIAM BAXTER, JR.

The storage battery came into the world with such a flourish of trumpets, and failed so completely to accomplish all that was expected of it, that for a long time it rested under a heavy cloud. The sensational press, ever ready to exaggerate the possibilities of new inventions, made claims for it that were far beyond the limits attainable, even by theoretical perfection, and those engaged in promoting its interests, either through ill advice, or an over-sanguine estimate of its capabilities, subjected it to the most trying tests, believing, no doubt, that if it succeeded in these, its future would at once be established on a firm foundation. The results of these tests, as every one knows, were disastrous, and, during the following years, those who spent their time and money in endeavors to improve upon the work of the past were looked upon as impracticable dreamers. But through the efforts of these men very decided improvements have been made, and the batteries of to-day are thoroughly practical and reliable, for a certain line of work, although they have not reached that point of perfection where they can be used with success for the purposes to which they were first applied; that is, for the propulsion of railway cars.

At the present time it is considered by those who have given the subject the most thought that storage batteries can be used advantageously in several ways; they can be used to equalize the load in lighting and power stations, to keep up the electrical pressure at the end of long transmission lines, to increase the capacity of a station, and to reduce the cost of transmission lines, by acting as transformers. To equalize the load and to increase the capacity of stations they are now used quite extensively, and are gaining a foothold in this field with remarkable rapidity. Among the larger stations where they are used for one or the other of these purposes may be mentioned: The Edison Illuminating Company, of New York City; the Hartford Electric Company (which is installing the largest plant in the world, at the present time; its capacity being nearly four thousand horse power); the Union Traction Company, of Philadelphia; the Boston, and the Lawrence, Massachusetts, Electric Illuminating Companies.

The advantages to be derived from the use of storage batteries in power and lighting stations, from an economic point of view, arise from the fact that the load upon the engines varies within very wide limits, at different times of the day, and as a consequence the average output of the plant is considerably below the full capacity. This causes a loss in two ways, one of which is through the inability to utilize the full capacity of the machinery and the other through the reduced economy of the engines, due to the fact that they must work nearly all the time at an output far below that which gives the highest efficiency.

In an electric lighting station the greatest demand for power is between the hours of six and seven P.M. and the next greatest between about the same hours in the morning. During the balance of the time the consumption is much lower, and after midnight it falls off to very nearly nothing. If steam engines alone are used, their capacity must be sufficient to meet the greatest demand, even if that only lasts for a few minutes; but, if storage batteries are added to the plant, these can be depended upon to take care of the excessive demands, and then the engine capacity can be considerably reduced.

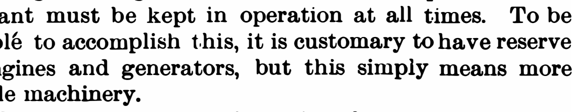
The gain that can be effected by resorting to this expedient is more clearly shown in the accompanying diagram, which represents the condition of current demand in a station which, with steam engines alone, would require a capacity of about two thousand horse power, and if provided with storage batteries, would require something less than 1,200 horse power. Starting from the left side of the diagram it will be seen that at midnight the demand is about 500 horse power, and this drops to a little over one hundred by two o'clock. At five it takes a sudden start and passes above fourteen hundred at seven o'clock, and then drops rapidly again until noon, when it is about eight hundred. From this time on until six P. M. the demand constantly increases, and reaches a maximum of nearly 1,900 horse power.

* In SUPPLEMENT 998 is contained an illustrated description of a slightly different form of motor cycle.

This curve would represent the average consumption of power, taking one day with another, but on special occasions the demand would be greater; therefore, at least two thousand horse power engine capacity would be required to successfully meet all demands. As can be seen from the diagram, the output for more than nine-tenths of the time would be very far below the full capacity of the engines, and, as a consequence, the efficiency would be low. The total area of the diagram represents the power the engines could furnish if worked to their full capacity, all the time, and the portion below the curve line the amount of power that is actually developed. This latter portion, it will be seen, is less than one-half of the whole; hence, the average supply, from which a revenue is obtained, is less than half the capacity of the plant.

Besides the inability to utilize the full capacity of the plant, there are two other serious objections to this arrangement. One is that, if anything goes wrong with the machinery and it becomes necessary to shut down, the lights will go out; the other is that a portion of the plant must be kept in operation at all times. To be able to accomplish this, it is customary to have reserve engines and generators, but this simply means more idle machinery.

By the use of storage batteries, the conditions can be greatly improved, as an engine capacity of about 1,150 horse power working continuously for about seventeen hours per day would furnish all the power required. The rectangle, of which A and B are the diagonals, represents this constant output, and the shaded portions of it, marked 1, 2, and 3, show the power that would be charged into the batteries, during the hours when the demand runs below the engine capacity and also the time when the charging takes place. The shaded parts, 4, 5, 6, outside of the rectangle, A, B, represent the power furnished by the batteries when the demand is greater than the engine capacity or the latter are shut down. The section 4 shows the power that is supplied while the engines are shut down and 5 and 6 the power supplied when the demand runs above the capacity of the engines.



GAIN BY THE USE OF STORAGE BATTERIES.

As there is a loss in charging and discharging the batteries, the energy put into them must be greater than that taken out, that is, the sum of the shaded portions, 1, 2, 3, must be greater than that of 4, 5, 6; but, for all that, the arrangement is decidedly advantageous, because the capacity of the engines and electric generators can be reduced to about one-half, and the plant can be shut down for a period of from four to five hours every night, thus giving ample opportunity to make necessary repairs.

From the foregoing it will be seen that the use of storage batteries in connection with lighting and power stations is beneficial in the highest degree. Not only is the cost of operation greatly reduced, but the reliability of the service is materially increased, for if at any time it becomes necessary to stop the machinery, the batteries can keep up the supply until it is started up again, that is, if the time of the shutdown does not exceed two or three hours, and it is very seldom that anything happens that requires a stoppage of more than a few minutes. In addition to the advantages mentioned in the foregoing, if a station becomes too small to meet the demands upon it, its capacity can be nearly doubled by the installation of a battery plant, and the increase can be made still greater if the engines are shut down only two or three hours every night, instead of five, as between the hours of 1 and 5 A. M. nearly all the power could be stored.

In Europe the storage battery is used in stations to a far greater extent than here, where, until within the past year or so, it has made but little headway. Now, however, it is gaining very fast, and before long will, no doubt, be considered an indispensable adjunct in all stations.

THE output of petroleum in Java has been considerably increased lately, but it is expected that with an improved plant the production may still be doubled. The Dordrecht Company owning the oil wells is in a very prosperous condition, having been able to declare dividends up to 62 per cent.—Uhland's Wochenschrift.

What Can be Done with Salt.

Salt cleanses the palate and furred tongue, and a gargle of salt and water is often efficacious. A pinch of salt on the tongue, followed ten minutes afterward by a drink of cold water, often cures a sick headache. Salt hardens gums, makes teeth white and sweetens the breath. Cut flowers may be kept fresh by adding salt to the water. Weak ankles should be rubbed with solution of salt, water and alcohol. Rose colds, hay fever and kindred affections may be much relieved by using fine dry salt, like snuff. Dyspepsia, heartburn and indigestion are relieved by a cup of hot water in which a small spoonful of salt has been melted. Salt and water will sometimes revive an unconscious person when hurt, if brandy or other remedies are not at hand. Hemorrhage from tooth pulling is stopped by filling the mouth with salt and water. Weak and tired eyes are refreshed by bathing with warm water and salt. Public speakers and many noted singers use a wash of salt and water before and after using the voice, as it strengthens the organs of the throat. Salt rubbed into the scalp or occasionally added to the water in washing prevents the hair falling out. Feathers uncurled by damp weather are quickly dried by shaking over a fire in which salt has been thrown. Salt always should be eaten with nuts, and a dessert fruit salt used should be specially made.

If twenty pounds of salt and ten pounds of nitrate of ammonia be dissolved in several gallons of water and bottled, many fires may be prevented. By splashing and spraying the burning articles the fire is soon extinguished. An incombustible coating is immediately formed. Add salt to the water in which black and white cotton goods are washed. Flatirons may be made smooth if rubbed over salt. Copper and glass may be quickly cleansed by dipping half a lemon in fine salt, then rubbing it over stained objects. Lemons and salt also remove stains from the fingers. Do not use soap afterward. If a small teaspoonful of salt be added to a quart of milk it will be preserved sweet and pure for several days. A pinch of salt added to mustard prevents it souring. A smouldering or dull fire may be cleared for broiling by a handful of salt.

Salt thrown on any burning substance will stop the smoke and blaze. Bread insufficiently salted becomes acid, dry and crumbles. Bread made with salt water is said to be good in some cases of consumption. When cabbages, onions or strong smelling vegetables have been boiled in pans, to prevent odors clinging to them place some salt on the stove and turn the pans bottom up over the salt. In a few minutes the pans will smell sweet.

All salads should be soaked in salt and water to destroy animalcules or small worms. Make a strong brine, and water garden walks to kill weeds. A moderate quantity of salt stimulates their growth. Salt and camphor in cold water is an excellent disinfectant in bedrooms. Housemaids should pour salt water, after using it, down the drain pipes. Sewer gas is counteracted by a handful of salt placed in toilet room basins. Water for laying dust is more effective when salt is added. Sea water is generally used in English coast towns for this purpose.

Rattan, bamboo and basket work furniture may be thoroughly cleaned by scrubbing with brush and salt water. Japanese and plain straw matting should be washed with salt and water and rubbed dry. This keeps them soft and prevents brittle cracking where traffic is heavier. Brooms soaked in hot salt water wear better and do not break. Bedroom floors may be kept cool and very fresh in summer if wiped daily with a cloth wrung out of strong salt water. All microbes, moths and pests are thus destroyed. Black spots on dishes and discolorations on teacups are removed by damp salt.—Philadelphia Ledger.

The Lead Tree.

The difference in the strength of the affinity existing between different substances may be easily illustrated by the following experiment: Dissolve an ounce of acetate of lead ("sugar of lead") in a quart of water and fill a glass jar with the solution. If a piece of zinc (or a few spirals of the same metal) be now suspended in the liquid, it will, after a short time, become covered with a gray coating, from which brilliant metallic spangles will shoot forth somewhat in the shape of a tree. These are pure lead, and the phenomenon is familiarly known as the "lead tree." The effect thus produced is due to the superior affinity of the zinc for the acetic acid conbined with the lead, and which causes the two metals to interchange places—the zinc combining with the acid and entering into solution and the lead being deposited in the metallic state in place of the zinc. If the action be kept up long enough, every particle of lead may in this way be withdrawn from the liquid.

This pleasing experiment is greatly dependent upon electro-chemical action. The first portions of the lead form with the zinc a voltaic arrangement of sufficient power to dissolve the salt. Under the peculiar circumstances in which the latter is placed, the metal is precipitated upon the negative portion (the lead), while the oxygen and acid are taken up by the zinc.

The Form of the Head as Influenced by Growth.

The change in the shape of the head which accompanies growth has been but very slightly investigated either in this country or abroad. The meagerness of results may be indicated by the fact that Topinard's Elements d'Anthropologie contains only a note upon the subject, with no data. A recent investigation upon the students of the Massachusetts Institute of Technology may be of interest as bearing upon this question. The measurements covered 485 students, grouped as follows: 215 in the first year class; 69 in the second; 66 in the third, and 136 in the graduating class.

From the comparison of the measurements of the length and breadth of the heads of these students so divided into classes, it appears that between the period of entrance and of graduation, that is to say from the ages of 18–19 to 23–24 years, the development of the head is almost entirely in respect of its length. The average breadth of the head remaining constant at or near 152 mm., the length varies from an average of 195·13 mm. in the first year to 196·35 in the fourth year class. The intermediate classes occupy a position midway between the two, indicating that this is not a result of chance. If this tendency be a general one, it means that the cephalic index in our American population of this class tends to decrease at this particular time of life. The cephalic index, for example, of the first year students averages 78·6 and that of the fourth year averages 77·2, the second and third years being 77·7. This is rendered specially significant by the fact that Drs. West and Porter have shown a slight decrease of cephalic index in American school children between the ages of 5 and 18; at Worcester, for example, the average index falling between 79 and 78.* If we assume that in both cases we are dealing with similar populations the hypothesis of a progressive decrease of cephalic index, with growth, of our American people would seem to be well founded.

In Europe, Zuckerhandl, comparing the index of 156 children and 197 adults of the same (Austrian) race, found that the children were narrower headed than adults as a rule; and Holl confirms this result.† Dr. Meis declares that from his experience the children among the Germans are more dolicho-cephalic than the adults.‡ Schaafhausen finds that in many cases the length of the head is attained before the full breadth.§ In Italy, Dr. Livi has brought together the results of a number of observers from both northern and southern Europe, but all of them from the broad-headed races.‖ The difference of cephalic index on the average among 447 cases here amounts to one unit in favor of broadheadedness of the adult, the contrary tendency to that noted for the Americans. That age brings a relative increase in the breadth of the head was also apparently indicated by the few measurements made by Welcker.¶ For Bohemia, Dr. Matiegka, from measurements on 400 children, asserted that there is no tendency toward a change in the relative length and breadth in the cases observed by him.** Dr. Boas finds that in the North American Indians age is characterized by a relative increase in the length.††

On the whole, summarizing the results and opinions of these various writers, whose conclusions are, on the whole, contrary to our American ones, it appears that no universal rule can be established with respect to the effect of age upon the proportions of the head. The only hypothesis which seems to be confirmed by all this evidence is that development brings an approximation to the racial type most clearly marked in the adult. In other words, in the narrowheaded races, like our own, the children are broader headed than the adults. Among the brachy-cephalic races, such as those instanced by Dr. Livi and most of the others cited, the children exhibit the race peculiarity in a less marked degree, that is, they are relatively narrower headed than at maturity. Finally the change from childhood to maturity becomes nil where the adults themselves belong to a group with a cephalic index near the mean for the entire European race. No relation can be established between the intelligence and the proportions of the head so far as the experience of European study goes, although Krause and Virchow declare in favor of the broadheaded type. If this hypothesis be true that age brings the fuller development of the race type, it may be possible in the future to apply a correction to the comparative results obtained by students of anthropology whose results are drawn from the study of children. But until that time the inferences to be drawn from such study are as likely to be erroneous as are conclusions drawn from the study of the color of the hair and eyes of school children, since in both cases maturity brings a change which has not as yet been statistically measured. It is earnestly hoped that further study along this line may be undertaken. The testimony of expert psychologists would be also of interest as bearing upon this point. In the hope of stimulating some such investigations, the modest results obtained from this study at the Institute of Technology are submitted.—W. Z. Ripley, in Science.

* Archiv fur Anthropologie, xxii, pp. 19 and 34; and Report of Anthropological Congress at Chicago, p. 57.

† Mitt. der Anth. Gesell. in Wien. xiv, 1884, p. 127; and Ibid. xviii, p. 4.

‡ Ibid., xx, 1890, p. 39 seq.

§ Uber die Urform des Menschlichen Schadels, in report of Congres Int. d'Anth. et d'Archæologie, Paris, 1867.

‖ L'Indice Cefalico degli Italiani, Florence, 1886, p. 15.

¶ Archiv. fur Anthropologie, I, p. 151.

** Mitt. der Anth. Gesell. in Wien, xxii, 1892, Sitzungsberichten, p. 81.

†† Verh. der Berliner Gesell. fur Anth., Sitzber. May 18, 1895, p. 392.

The Commonest Names.

These are the fifty most common surnames of the babies born in England and Wales, in Scotland, and in Ireland, arranged in the order of their numerical importance:

	England and Wales.	Scotland.	Ireland.
1	Smith	Smith	Murphy.
2	Jones	McDonald	Kelly.
3	Williams	Brown	Sullivan.
4	Taylor	Thomson	Walsh.
5	Davies	Robertson	Smith.
6	Brown	Stewart	O'Brien.
7	Thomas	Campbell	Bryne.
8	Evans	Wilson	Byrnes.
9	Roberts	Anderson	Connor.
10	Johnson	Scott	O'Neill.
11	Wilson	Miller	Reilly.
12	Robinson	McKenzie	Doyle.
13	Wright	Reid	McCarthy.
14	Wood	Ross	Gallagher.
15	Thompson	McKay	Doherty.
16	Hall	Johnston	Kennedy.
17	Green	Murray	Lynch.
18	Walker	Clark	Murray.
19	Hughes	Paterson	Quinn.
20	Edwards	Young	Moore.
21	Lewis	Fraser	McLaughlin.
22	White	McLean	Carroll.
23	Turner	Henderson	Connolly.
24	Jackson	Mitchell	Daly.
25	Hill	Morrison	Connell.
26	Harris	Cameron	Wilson.
27	Clark	Watson	Dunne.
28	Cooper	Walker	Brennan.
29	Harrison	Taylor	Burke.
30	Ward	McLeod	Collins.
31	Martin	Ferguson	Campbell.
32	Davis	Duncan	Clarke.
33	Baker	Gray	Johnson.
34	Morris	Davidson	Hughes.
35	James	Hunter	Farrell.
36	King	Hamilton	Fitzgerald.
37	Morgan	Kerr	Brown.
38	Allen	Grant	Martin.
39	Moore	McIntosh	Maguire.
40	Parker	Graham	Nolan.
41	Clarke	White	Flynn.
42	Cook	Allan	Thompson.
43	Price	Simpson	Callaghan.
44	Phillips	McGregor	O'Donnell.
45	Shaw	Munro	Duffy.
46	Bennett	Sinclair	Mahony.
47	Lee	Bell	Boyle.
48	Watson	Martin	Healy.
49	Griffiths	Russell	Shea.
50	Carter	Gordon	White.

—From the Pall Mall Magazine.

Screws in Stone Walls.

A Dusseldorf engineer, knowing from experience that wooden dowels for the purpose of securing screws in stone are apt to weaken the walls and do not afford the desired solidity, has devised an ingenious method of obtaining a firm anchorage. For this purpose a wire of suitable thickness is coiled on to the screw, so as to follow the threads of the same and to form a kind of screw nut. The coiling may commence near the head or thick end of the bolt and proceed toward the point by laying the wire into or between the threads, so as to touch the bottom of the same, the section of each screw thread being preferably triangular or trapezoidal and the core of the screw conical (similar to a wood screw). After arriving at the point of the screw the wire may be wound backward over the helix already wound on, but with a steeper pitch, so as to leave wider interstices between consecutive convolutions of the wire. After the wire has been laid on so as to form a nut, and then the screw withdrawn, the nut or wire coil is introduced into a hole which has been drilled or otherwise formed in the wall for this purpose, and which is slightly wider than the diameter of the nut measured over the outer layer of the wire, after which the interstices are filled up with plaster of Paris, cement, or similar binding material in a plastic condition. When the said binding material has become sufficiently hard and firm, the screw bolt which has served as a core, or another screw bolt having the same diameter and pitch, is screwed into the wire coil, and may now be screwed out and in repeatedly without damaging the wall, because the wire serves as a screw nut, which is secured to the stone or wall by the cement or other binding material.—Philadelphia Record.

The "Meteor" Gas Burner.

A new incandescent gas burner called the "Meteor" burner has been placed on the German market at the remarkably low price of 3½ marks (less than $1). This burner has the usual rod to hold the incandescent mantle, but instead of being steadied on the inside at its lower end, the mantle is held by a sleeve which fits on the outside of the mantle and thereby protects it. The new burner is said to give a very satisfactory light.—Wiener Gewerbe-Zeitung.

Science Notes.

The Paris municipality has changed the name of the well known Boulevard de Vaurigard to Boulevard Pasteur.

James Dredge, Esq., editor of Engineering, of London, has been appointed commissioner-general for Great Britain to the national exposition to be held at Brussels.

Kellas concludes from his experiments that exhaled air contains more argon than before inhalation; from this he infers that it is an important element in the animal economy.

An aquarium and marine biological station is to be established at Honolulu for the study of the marine life of the Pacific. It is said that the expense will be $750,000, and that the funds will be furnished by Mr. C. R. Bishop.

Prof. Atkinson has discovered near Cornell University a "plant atoll," so called from its similarity in some respects to a coral atoll. Only two plant atolls had previously been known. This atoll consists of a ring of growing shrubs floating in a pond, inclosing a circle of water, and surrounded by water. The matted roots hold sufficient decayed vegetable matter to nourish the plants, and as more dead plants and leaves are accumulated year by year the ring is in process of becoming anchored to the bottom of the pond, or, in other words, of forming a ring of earth out in the middle of the pond. The origin of these curious botanical freaks can only be guessed at.

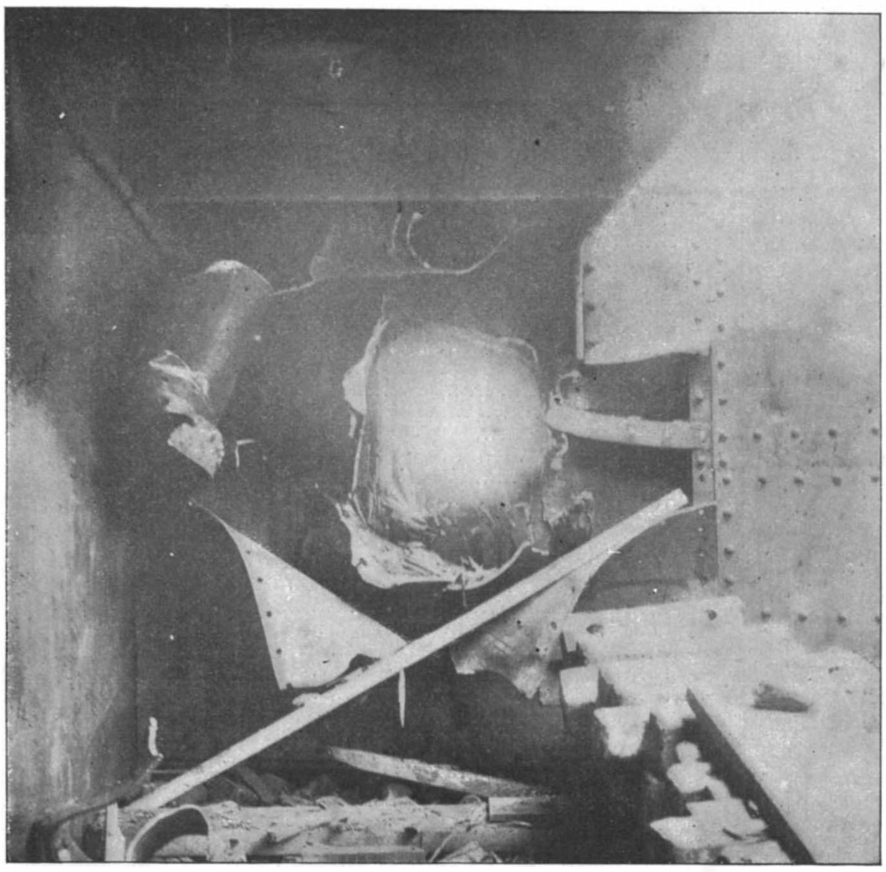
In the Atti dei Lincei, Dr. Vittorio Abelli describes a remarkable case which occurred in the course of a scientific expedition on the slopes of Monte Rosa, says Nature. At an altitude of 4,560 meters a member of the party, twenty-two years of age, was suddenly attacked with pulmonitis, and subsequently completely recovered from the disease. This led Dr. Desiderio Kuthy, of Budapest, to carry on a series of experiments on the action of rarefied air on the Diplococcus of pulmonitis, and also on the Pneumococcus of Fraenkel. Two conclusions were drawn from these investigations: first, that rabbits, after being inoculated with this Pneumococcus, die more rapidly when they are surrounded by air at the reduced pressure corresponding to that on Monte Rosa; secondly, that this occurs, although the Pneumococcus is less virulent when it is developed in rarefied air. In the case of the youth Ramella, Dr. Kuthy considers that the infection was mitigated in consequence of the attenuation of the Pneumococcus arising from the rarefaction of the air, but the same circumstance caused the attack to be more violent in spite of the mildness of the infection.

Referring to a report made by the physiological department of Yale University on the influence of alcoholic drinks upon the chemical processes of digestion, Nature (London) says: The investigations were made by means of artificial digestive experiments, in which the digestive fluids were allowed to act upon the various food substances under definite and constant conditions. Absolute alcohol in four cases appeared to actually stimulate digestive action by a fraction of 1 per cent, but the amount of alcohol present did not exceed 1 or 2 per cent. Whenever alcohol was added in quantities over 2 per cent, digestive activity was markedly checked; in one instance 3 per cent of alcohol reduced the digestive activity by 17·6 per cent. Pure rye whisky containing 5 to 51 per cent of alcohol yielded practically the same results; even an addition of 1 per cent of this spirit was found, taking the average of the experiments, to reduce digestive activity by over 6 per cent. In three cases, however, an increase in digestivity of from 3 to 5 per cent was recorded when additions of whisky in the proportion of from 1 to 3 per cent were made. Brandy, rum and gin gave practically the same results. Whisky can be considered to impede the solvent action of the gastric juice only when taken immoderately and in intoxicating quantities.

Dr. J. A. Harker recently read a paper before the London section of the Royal Society on the determination of the freezing point of mercurial thermometers. The method adopted is to cool distilled water in a suitable vessel to a temperature below 0°, to insert the thermometer, and then bring about the freezing of the water by dropping in a crystal of ice. The thermometer then rises, and finally attains a steady temperature, differing only very slightly from the true zero. The apparatus employed consists of two portions, the thermostat and the cooler. The former is a copper vessel, filled with either refined petroleum or a strong solution of common salt. This vessel communicates with the cooler, through which the liquid can be pumped by a rotary stirrer; and by this means it can be cooled and maintained for some time at about −2°. The distilled water to be frozen is contained in a glass tube of about 300 c. c. capacity. This is first placed directly into the circulating liquid, and cooled quickly to −0·5° or −0·7°. It is then transferred to a cylinder lined with polished metal, placed in the center of the thermostat. The thermometer whose zero is to be taken is then quickly fixed in position, the bulb and a considerable length of the stem above the zero being immersed in the water. A crystal of ice is dropped in, and the temperature quickly rises to the freezing point.

TURRET OF THE BATTLESHIP MASSACHUSETTS UNDER FIRE.

An experimental turret, representing similar structures on the United States battleship Massachusetts, was tested last spring under conditions such as will obtain in an actual sea fight, and we are now enabled to present our readers with photographic reproductions which show how it stood the ordeal.



INTERNAL VIEW OF SHOT HOLE SHOWING DESTRUCTION OF BACKING, FRAMEWORK, AND COVERING PLATES.

The ballistic tests which are continually being made upon armor plate furnish very complete information regarding its ability to keep out projectiles. There is not a battleship in any of the navies of the world regarding which a naval expert could not tell us the powers of resistance possessed by its armor. There are other questions, however, to be considered in addition to that of the mere resistance of armor to penetration. The plate would afford but little protection unless it were well supported or "backed" by the framing of the ship itself. Even if a shell should fail to get through, there is a possibility that it will drive the plates bodily within the structure of the ship, racking and distorting the skeleton framework to which the armor is bolted. Our readers will remember the test made late last year of a structure representing the sides of the battleship Iowa, which was illustrated in the SCIENTIFIC AMERICAN of November 9. The results showed that the framing had ample strength to hold the plate up against the heaviest shells.

It was felt by the Bureau of Ordnance, however, that the experiments would not be complete until a test had been made of the armored turrets of our battleships. The fact that the framework of the ship itself could stand the impact of heavy projectiles was no proof that the revolving turrets, which carry the big guns, would be equally secure. A slight deformation of the plates and beams of the backing, which would be of but little consequence in the fixed sides of the ship, might interfere with the working of a huge turret, rotating as it does on a circle of steel rollers, and having clearances of only a few inches between itself and the walls of the barbette. Even if the structure of the turret itself were not distorted, it was possible that it might be moved bodily upon its supports, in which event the elaborate gear, hydraulic or otherwise, for turning the turret would be disabled, and the whole mass, with its two big guns, constituting one-half the main fighting power of the ship, become wedged in its seat and rendered all but useless.

It was determined to make a test of an experimental turret which should be practically, at least for the purposes of the test, a facsimile of the turret of the battleship Massachusetts. A solid foundation of piling covered with heavy timber was built, and upon this was laid a circular track of wrought iron plates, answering to the roller track of the Massachusetts. The experimental turret was about 27 feet interior diameter and 11 feet high. Its framework, consisting of vertical angle frames and horizontal channel irons, carried ten cast iron plates, 15 inches thick, and one steel test plate representing the turret armor of the Massachusetts. Interior girders, similar to those used for carrying the gun, were built in place, and 180 tons of pig iron were so disposed within the turret as to represent the actual weights of the gun and gear. The weight of the complete structure was 450 tons, and it was carried on twenty cylindrical rollers of steel, which were prevented from transverse movement by means of wrought iron wedges. The experimental steel plate was one which had already been used in experimental tests, and had successfully resisted two heavy armor piercing shells, the points of which were embedded within it. In the present experiment three rounds were fired, as per the accompanying table:

	Round 1.	Round 2.	Round 3.
Gun..........	10 inch.	12 inch.	12 inch.
Projectile. ...	500 pounds.	850 pounds.	851 pounds.
Velocity	1,683 foot secs.	1,701 foot secs.	2,000 foot secs.
Energy	9,829 foot tons.	17,069 foot tons.	23,626 foot tons.

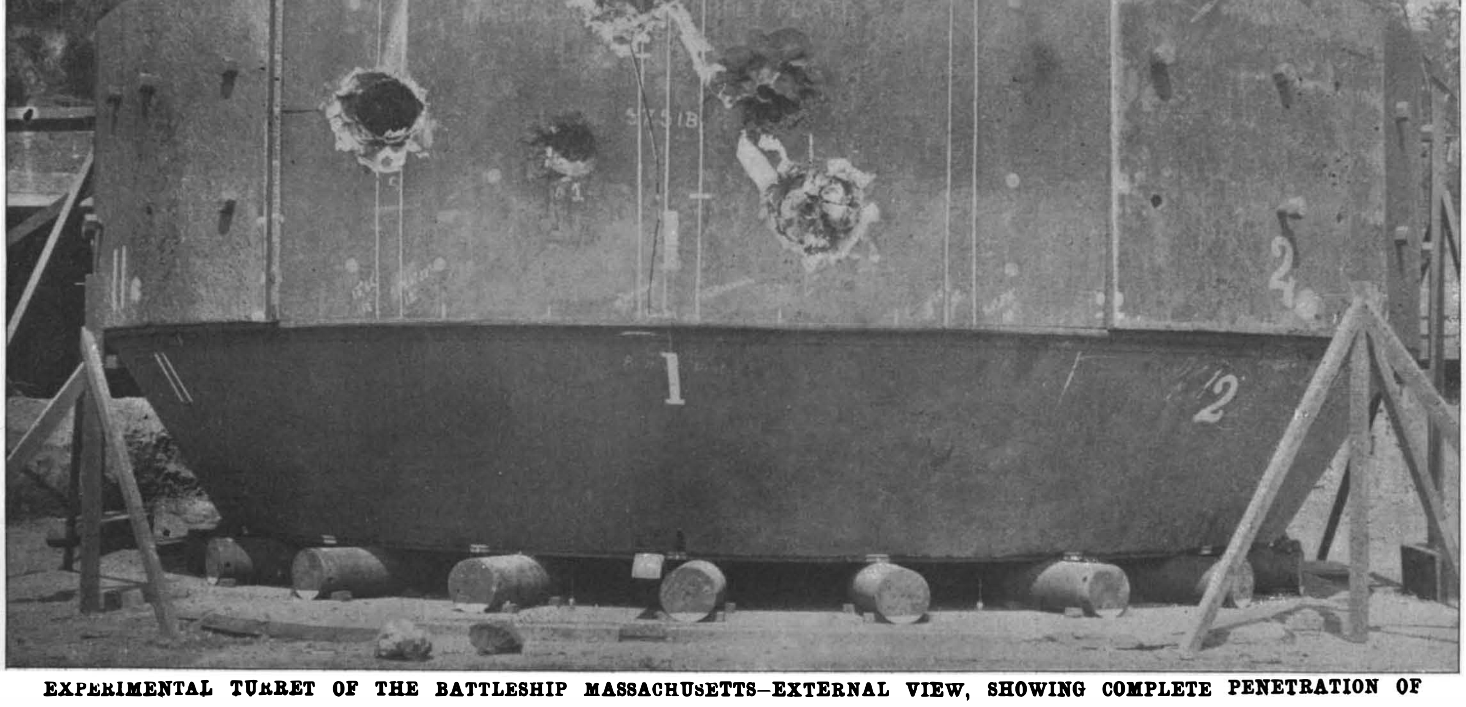
The first shell, a 10 inch Wheeler-Sterling, broke upon the plate with a penetration of 9½ inches. The point of impact was 14½ inches from the top of the plate and 2 feet to the left of the second of the points of impact above mentioned. A piece of the plate above the point of impact, 33 inches wide, was carried away, and the roof plates of the turret were wrenched upward to a height of 1 inch. The armor bolts were uninjured and there was no movement of the plates on the turret. The whole turret was moved backward on its rollers for a distance of 1¾ inches.

The second shell struck the turret at an angle of 7½° from the normal. This projectile penetrated 11½ inches and broke up, the head remaining welded to the plate. The plate was cracked diagonally through the last shot hole and through one of the old points of impact to the bottom of the plate. One armor bolt was broken and driven into the turret. The adjoining cast iron plate to the right was slightly displaced. The horizontal channel irons of the framework were buckled to the extent of one inch. The splinter bulkhead to the left was buckled to the extent of 3 inches. The turret itself was carried to the rear a distance of 7¼ inches, and was also turned about its axis slightly. There was no distortion of the structure considered as a whole.

The third shot was a Johnson fluid compressed steel armor piercing shot, similar to that shown in our last week's issue, but 12 inches in diameter. It carried a soft steel cap and weighed 851 pounds. It struck the plate at an angle of 21° from the normal, at a point about 3 feet from the left edge and 3 feet from the top of the plate. It will be noticed that the angle of impact was very large, and when the shot struck the plate, instead of following the line of fire, it turned sharply to the right and passed entirely through the plate on a line nearly normal to its surface.

The shot broke up in forcing its way through, the larger pieces going through the covering plate on the rear side of the turret, piercing the backing, smashing off a large portion of the rear cast iron plate, and finally going into the woods behind the target.

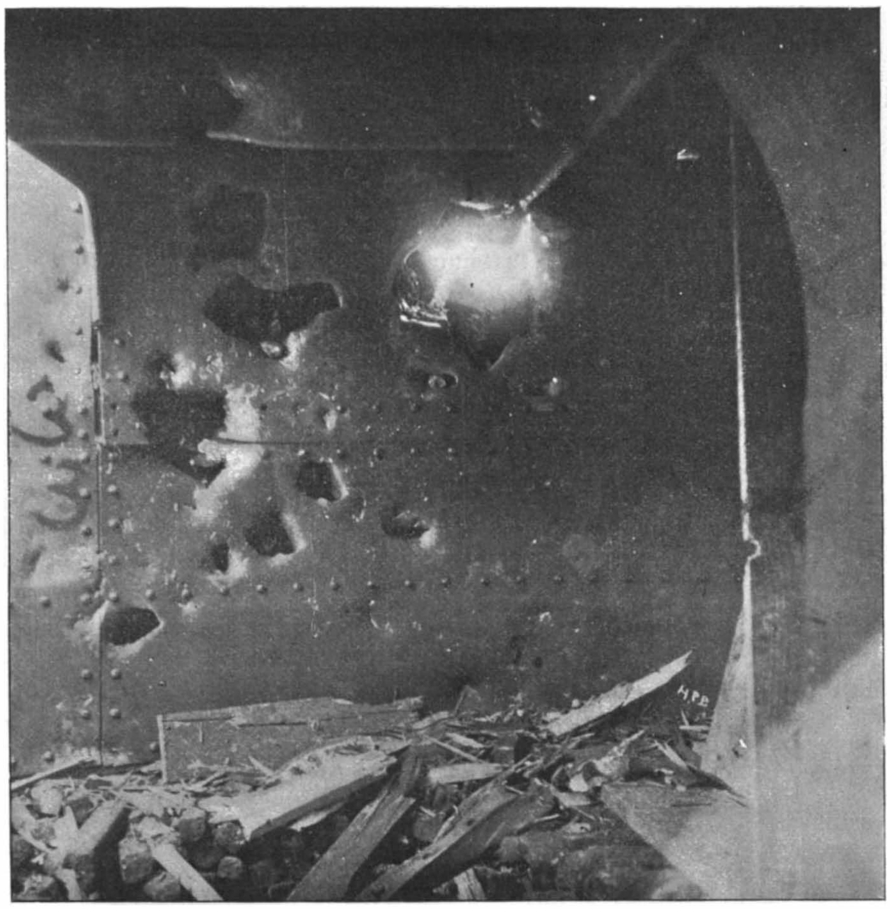
The destructive effect of the shot is shown very graphically in the accompanying illustrations. The back of the ballistic armor plate was broken out for a diameter of two feet around the hole; pieces of the steel being driven through the turret and scattering in all directions. The backing was carried away and splintered; the plating behind the backing being folded back and wrecked over an area of 3½ feet square. Rivets were sheared and flew all over the turret, leaving their marks on the interior. The channel beam at the rear of the shot hole was ripped off and thrown across the turret. A jagged hole, 7 inches in diameter, was torn through an adjoining deck beam. The interior vertical covering plates on the opposite side of the turret were pierced with eighteen holes and showed numerous deep gouges and scars caused by the flying fragments. The turret structure over an area of 4 square feet where the shot struck was badly wrecked. The backing on the rear side was wrecked and splintered and the 15 inch cast iron plate badly cracked, two large pieces of the latter being thrown to the rear, leaving



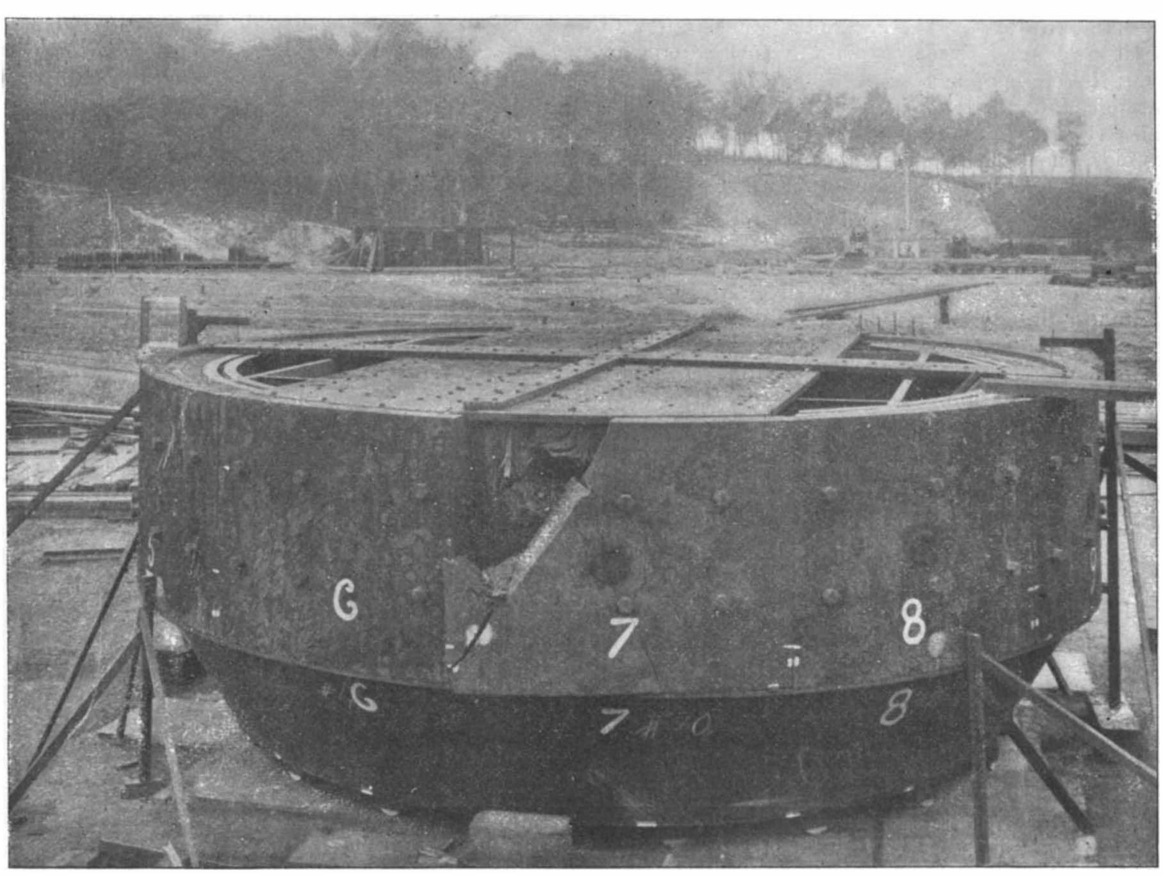
EXPERIMENTAL TURRET OF THE BATTLESHIP MASSACHUSETTS—EXTERNAL VIEW, SHOWING COMPLETE PENETRATION OF 15 INCH HARVEYIZED NICKEL STEEL PLATE.

a triangular hole 4 feet high and 4 feet wide. All six of the armor bolts holding these plates were broken, and the plate itself was forced to the rear 9 inches on one edge and 2 inches on the other. This impact moved the turret 9 inches to the rear in a direction making an angle of nearly 8° with the line of the movement in the two previous impacts. It also revolved around its center to the left through an angle of 2°. The result of the test proves that the framing of the turret has ample strength to resist the heaviest strains that could come upon it under fire. The fact that the turret as a whole moved as much as 9 inches under the energy of the shot raises the question of the sufficiency of the means adopted to hold the turrets of our battleships in place. As at present constructed, the tendency to translation of the turret is resisted by the flanges of the steel rollers upon which it revolves, and it is estimated by Commodore W. T. Sampson that these flanges present an ample margin of strength to resist the shearing action to which they are subjected. When the 33,000 foot tons of energy of a 13 inch shot is communicated to the turret, a part of it is expended in piercing or breaking up the plate and part of it causes the whole turret to move until the roller flanges take hold of the edges of the roller track. According to the last authority, the pressure of a 13 inch gun against its recoil cylinders when it is fired brings a strain upon the roller bearings far greater than they can ever experience under the momentum of a heavy shot. Altogether this very interesting test establishes the excellence of the system of turret construction as carried out in our new battleships.

Referring again to the photographs showing the destruction wrought in the interior of the turret by the flying fragments of the successful shot, it is evident that had the turret been occupied by actual guns and gun crew, the gun itself and the larger part of the crew would have been disabled. It is also noteworthy that successful penetration was effected in spite of the fact that the shot struck at a high angle of incidence, and there is no doubt but what it was largely due to the action of the soft steel cap, as explained in our last issue.



INTERNAL VIEW SHOWING PENETRATION AND DESTRUCTION OF REAR WALL OF TURRET BY FLYING FRAGMENTS OF THE SHOT AND ARMOR.



EXTERNAL VIEW OF REAR WALL, SHOWING DESTRUCTION OF 15 INCH PLATE BY FRAGMENT OF SHOT WHICH PASSED THROUGH TURRET. 12 INCH GUN SHOWN IN THE DISTANCE.

Plans for the Proposed Zoological Park in New York.

Last spring the plans of the New York Zoological Society reached a point where it became necessary to take up the many questions involved in the design and construction of buildings and other inclosures for animals, and also their arrangement in the proposed Zoological Park. The executive committee realized the necessity of a thorough examination and study of the best zoological gardens of Europe.

Accordingly, says Science, Mr. William T. Hornaday, the director, was instructed to visit all the large gardens of Europe, examine them carefully, and bring back photographs and designs of their most valuable and interesting features. He left New York in June, and visited the zoological gardens of the following cities, in the order named: London, Antwerp, Rotterdam, The Hague, Amsterdam, Hanover, Hamburg, Berlin, Dresden, Leipsic, Frankfort, Cologne, and Paris. Altogether fifteen gardens were inspected, and their best features were photographed, sketched and studied throughout. Without an exception, the directors, superintendents and inspectors of the gardens visited were very cordial. Every fact asked for was cheerfully furnished, without the slightest hesitation or reservation. Not only were good features pointed out as being worthy of special attention, but some officers very kindly indicated the mistakes that had been made in their gardens in the early days when everything had to be determined by experiment, thus showing what to avoid.

In London, Dr. P. L. Sclater, the executive head of the London Zoological Society, gave all the information and facilities for photographing that were desired in the society's gardens, and Mr. Clarence Bartlett, Assistant Superintendent, explained the entire working machinery of this truly magnificent zoological institution. At Antwerp the visitor is fairly amazed at the perfection of all the larger buildings for animals and the extreme beauty and attractiveness of nearly every feature of that scientific establishment. Director L'hoest and his assistant, M. J. De Winter, were untiring in their willingness to afford all the information desired, and to show everything not open to general view. Only two and one-half hours distant is found the beautiful garden at Rotterdam, known to but few Americans, where Dr. Von Bemmelin pointed out with pardonable pride the newest lion house in Europe, and the first great flying cage ever constructed for the larger wading birds. An equally short distance farther on, at Amsterdam, is found a very rich collection, installed amid charming surroundings, in which the health and "condition" of every bird and quadruped seems absolutely perfect. In the absence of Director Kerbert, Inspector Castens devoted hours of time to answering the question, "How do you keep everything in such fine condition?"

At Hanover, Dr. Ernest Schaff fully explained the plan of foundation and management of his zoological forest, and supplied a plan of the new and admirably constructed antelope house. At Berlin was found another royal establishment, with the larger mammalia housed in ornate and costly buildings. The garden occupies part of the imperial grounds and it is one of which the citizens of Berlin may well be proud. Dr. Ludwig Heck, its director, became much interested in the New York plan, and his co-operation was heartily extended. At Hamburg another very fine garden was inspected, in which all the shade is the result of artificial planting. It thus affords a fine opportunity to observe what can be accomplished if sufficient time is allowed. The shade trees are now very beautiful, and at once impress the expert visitor as being remarkably well distributed to serve their purpose of shading both the outdoor animals and the walks. Two days were spent with Herr Carl Hagenbeck, who has at Hamburg a Thierpark of his own, quite as large as the Central Park Menagerie of New York. Probably no man living has given more study to the problems of zoological garden construction and the care of animals in captivity, and Mr. Hornaday found him not only willing but eager to explain the mistakes to avoid, as well as the latest developments in the care of animals.

The director of the very interesting garden at Cologne, Dr. Wunderlich, was quite as ready with helpful information as his colleagues of other cities, and some of the features of his establishment were found to possess exceptional interest. The Frankfort garden contains much that is new and admirable. Prof. Milne Edwards, director of the Paris Jardin des Plantes, also extended every facility for study and examination of this the oldest garden of Europe. Regarding the status of a garden which, like this, is free to the entire public, the experiences and observations of Prof. Milne Edwards were both interesting and valuable. He expressed the opinion that no zoological garden should be kept open every day in the week, principally because it is not best for the collections.

The store of photographs, sketches, notes and plans collected during this tour are now being utilized in the preliminary plans for the New York park. It is proposed to determine the location and general design of every building and inclosure before the project is finally submitted to the city authorities in January, 1897.

The site selected by the society is the southern portion of Bronx Park, about a quarter of a mile south of the Botanical Garden. According to the charter granted to the society by the New York Legislature in 1895, the approval of this selection rests with the mayor and commissioners of the sinking fund.

A New Material for Floors.

According to a French exchange, the name of "papyrolith" has been given to a novelty in the way of a flooring material recently invented by Mr. Otto Kraner, of Chemnitz. The article is a special preparation of paper pulp in the form of a dry powder. This, when mixed with water, may be spread like mortar over stone, cement, or wood, where it dries quickly and may be smoothly planed; besides which, it may be tinted almost any color, so as to adapt it for parqueting with variegated borders, or for panels and mosaics. Among the advantages claimed by the inventor are freedom from crevices, non-conductivity of heat, elasticity, and remarkable durability.

IN Germany asparagus is peeled before being canned, by the aid of a special machine.

A PIONEER OF SCIENCE.

BY W. H. HALE.

Of the men who laid the foundations of scientific research in this country few indeed remain. The generation contemporary with Agassiz and Guyot, Joseph Henry, the Rogerses, T. Romeyn Beck, Morse and Hitchcock, has passed away; but a few of their associates still linger. Such a one I met not long ago secluded from the busy world in his quiet village home; a man who shares with the veteran geologist James Hall the distinction of having aided by his presence in organizing that early association of geologists at Philadelphia in 1840 out of which afterward sprang the American Association for the Advancement of Science.

Martin H. Boyé, M.D., was born at Copenhagen, Denmark, December 6, 1812. His father was a chemist and superintendent of a large pharmaceutical establishment and was superintendent of the Royal Porcelain Manufactory at Copenhagen. In 1831 he was admitted to the University of Copenhagen, where he passed with distinction the philological and philosophical examinations. He afterward entered the Polytechnic School, studying analytical chemistry and physics under Oersted, Zeise and Forchhammer, and he graduated from that institution in 1835.

In 1836 he came to New York, where he remained till 1837, when he removed to Philadelphia and attended the lectures of Dr. Robert Hare, professor of chemistry in the medical department of the University of Pennsylvania, assisting him also in his laboratory. In connection with Dr. Forman Leaming, he translated into English several essays on belles-lettres and chemical subjects. In 1838 he was appointed assistant geologist and chemist in the first geological survey of Pennsylvania under Prof. Henry D. Rogers, whom he accompanied on a tour of investigation through the anthracite coal regions.

The work assigned to Mr. Boyé was the exploration of the South Mountain or Lehigh Hills, a continuation of the Jersey Highlands, which extends from Easton to Reading, through the counties of Northampton, Lehigh and Berks, and the preparation of a geological map of this region. His name is mentioned in the report of the geological survey at this early date.

Young Boyé was thrown into close relations with the distinguished scientific family of Rogers. In 1839 and 1840 he was associated with Robert E. and James B. Rogers in analyzing limestone, coal, iron ores, etc., for the geological survey, as published in the reports. While engaged in these analyses he discovered, in conjunction with Prof. Henry D. Rogers, a new compound of platinum chloride with nitric oxide, which was reported to the American Philosophical Society, and in January, 1840, he was elected to membership in that society, being at that time the youngest member of the society in years, as he is now the oldest in membership, though not now the oldest in years.

A few months later, in April, 1840, about a score of scientists met at Philadelphia and organized the American Association of Geologists, subsequently renamed the American Association of Geologists and Naturalists, out of which, in 1848, was formed the American Association for the Advancement of Science. The importance of this movement can hardly be overestimated, as the American Association has always been true to its name, a powerful factor in advancing science.

This initial meeting in 1840 is, therefore, one of especial interest to scientists, and indeed, to all. Of that little company who met at Philadelphia, young Boyé, then only twenty-seven years old, was probably the youngest. Besides himself and James Hall, one other member survived till June 13 of the present year, when he died at Detroit. This was Bela Hubbard, who was already connected with the geological survey of Michigan, and who, in company with Douglas Houghton, made the journey from Michigan to Philadelphia by stage, consuming a week upon the route. Edward Hitchcock, of Amherst, was president, and Lewis C. Beck, of Albany, secretary of the association. No official record of the first members can be found, but the recollection of the survivors gives the following additional names: Prof. Vanuxem, Henry D. Rogers, Conrad, Charles B. Trego, and Alexander McKinley, of Pennsylvania; Emmons and Mather, of New York; James C. Booth, of Delaware; Dr. Hayden, of Virginia; and, probably, Prof. Johnson, of Philadelphia. This list was prepared by Bela Hubbard a few months before his death and revised by Dr. Boyé. Possibly, Dr. Charles E. West, of Brooklyn, was present at this meeting; if not so, he soon afterward became a member.

In the summer of the same year, Mr. Boyé in connection with J. J. Clark Hare discovered the first of the violent explosives, perchloric ether, which he proved was ten times as powerful as gunpowder. He also found a remedy against its unexpected explosion by dilution with alcohol. He was thus in an important sense a pioneer in the vast field of smokeless gunpowder, which has recently been so diligently investigated.

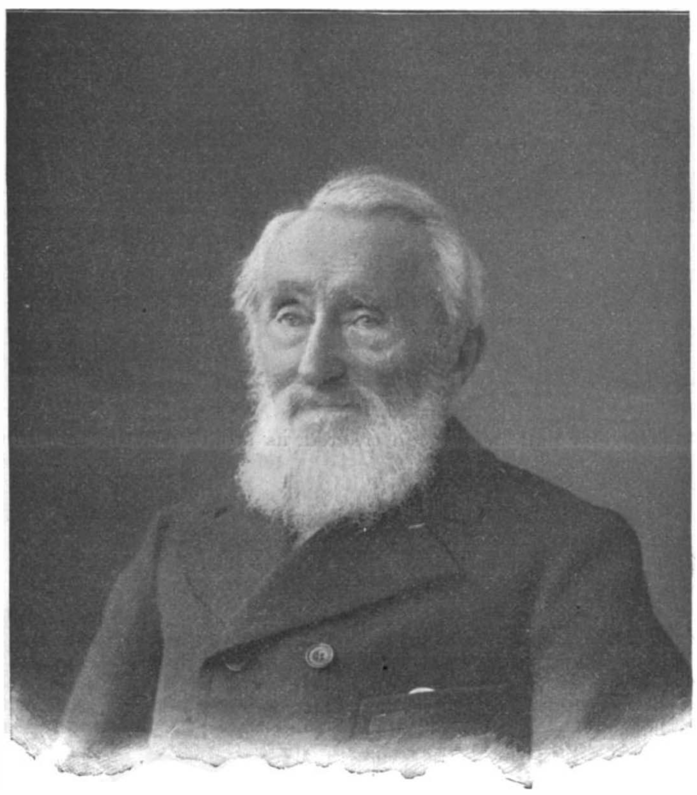
In the summer of 1841 he resumed field work, examining the bituminous coal regions along the Kiskimmetas and Allegheny Rivers and Beaver Creek.

In 1842–44 he attended the regular course of medical lectures at the University of Pennsylvania, at the same time conducting a chemical laboratory in connection with Prof. James C. Booth, and wrote for Booth's Chemical Encyclopedia the article on "Analysis," and others, and performed many scientific analyses. In connection with Prof. Booth, he read a paper on "The Conversion of Benzoic into Hippuric Acid," at the one hundredth anniversary of the American Philosophical Society.

In 1844 Mr. Boyé graduated at the University of Pennsylvania as a doctor of medicine, but he never practiced that profession. At the same time the collegiate department of the university conferred on him the honorary degree of master of arts. He is now by many years the oldest surviving recipient of an honorary degree from that university.

In 1845 Dr. Boyé was elected professor of natural philosophy and chemistry in the Central High School, of Philadelphia, and held this position till February, 1859. Of his work at this time, one of his pupils, now president of Lehigh University, Dr. Thomas M. Drown, writes that Dr. Boyé first inspired in him a love for chemistry. During this period Dr. Boyé wrote a treatise on "Pneumatics, or the Physics of Gases" (published 1856; also a small introductory treatise on "Chemistry, or the Physics of Atoms)"; he also delivered many public lectures.

The extraction of oil from cotton seed had already been undertaken, but the product was almost black and very thick. In 1845 he invented a process of refining, which produced a bland and colorless oil adapted for cooking or for salad dressing. Toilet soap made from it equaled or surpassed the best castile. In 1847–48 he began the manufacture and refinement of this oil on a large scale. This oil, some of which was preserved from 1848, and some was manufactured for the occasion, subsequently gained the award of a first premium at the Centennial Exposition of 1876, at Philadelphia.



MARTIN H. BOYÉ, M.D.

His early work in the field gave Dr. Boyé a practical familiarity with the picturesque region of eastern Pennsylvania, and enabled him to select for the home of his mature and declining years one of the loveliest nooks in that terrestrial Eden: he calls his home "Keewaydin," a name of the northwest wind from "Hiawatha." In 1859 he removed from Philadelphia to Coopersburg, Lehigh County, about nine miles south of Bethlehem, where he has ever since resided, engaged in what Washington termed the most noble and useful avocation of man—agriculture.

KRAUS, a German chemist, has according to the Pharmaceutical Era, investigated the extent and purpose of the rise of temperature at the time of flowering within the spathe of various species of plants. In one "he found this elevation to take place only in the daytime, the maximum attained being 38·5° C., or 11·7° above that of the air." In another "the period of maximum elevation is more variable, but it is never in the night. In this order the seat of the elevation of temperature is not the reproductive organs themselves, but the club-shaped appendix to the inflorescence, and it is accompanied by a rapid consumption of starch and sugar. All the plants in which this phenomenon occurs are entomophilous [frequented by insects], and Dr. Stahl sees in it a contrivance for attracting insects to assist in pollination."

How the Supreme Court Decides Cases.

Justice Harlan, of the Supreme Court of the United States, at a banquet in Cincinnati, O., October 3, gave the following interesting account of the method pursued by that body in deciding cases before it:

"In my intercourse with the members of the bar I have found, to my great surprise, that the impression prevails with some that cases, after being submitted, are divided among the judges, and that the court bases its judgment in each one wholly upon the report made by some one judge to whom that case has been assigned for examination and report. I have met with lawyers who actually believed that the opinion was written before the case was decided in conference, and that the only member of the court who fully examined the record and briefs was the one who prepared the opinion.

"It is my duty to say that the business in our court is not conducted in any such mode. Each justice is furnished with a printed copy of the record and with a copy of each brief filed, and each one examines the records and briefs at his chambers before the case is taken up for consideration. The cases are thoroughly discussed in conference—the discussion in some being necessarily more extended than in others. The discussion being concluded—and it is never concluded until each member of the court has said all that he desires to say—the roll is called, and each justice present and participating in the decision votes to affirm, reverse or modify as his examination and reflection suggests. The chief justice, after the conference, and without consulting his brethren, distributes the cases so decided for opinions. No justice knows, at the time he votes in a particular case, that he will be asked to become the organ of the court in that case; nor does any member of the court ask that a particular case be assigned to him.

"The next step is the preparation of the opinion by the justice to whom it has been assigned. The opinion, when prepared, is privately printed and a copy placed in the hands of each member of the court for examination and criticism. It is examined by each justice and returned to the author, with such criticisms and objections as are deemed necessary. If these objections are of a serious kind, affecting the general trend of the opinion, the writer calls the attention of the justices to them, that they may be passed upon. The author adopts such suggestions of mere form as meet his views. If objections are made to which the writer does not agree, they are considered in conference and are sustained or overruled as the majority may determine. The opinion is reprinted so as to express the final conclusions of the court and is then filed.

"Thus, you will observe, not only is the utmost care taken to make the opinion express the views of the court, but that the final judgment rests, in every case decided, upon the examination by each member of the court of the record and briefs. Let me say that during my entire service in the Supreme Court I have not known a single instance in which the court has determined a case merely upon the report of one or more justices as to what was contained in the record and as to what questions were properly presented by it. When you find an opinion of the court on file and published, the profession have the right to take it as expressing the deliberate views of the court, based upon a careful examination of the records and briefs by each justice participating in the judgment."—The Literary Digest.

Tetanus Antitoxin.

In the Deutsche Medicinische Wochenschrift, says Lancet, Prof. Behring informs the profession that the Hoechst factory, which also produces the diphtheria antitoxin, is authorized to sell the new tetanus antitoxin. The production will be placed under state control in the government laboratory directed by Prof. Ehrlich, each bottle bearing the official stamp. The remedy is to be issued in two forms: 1. In dry preparation, 1 gramme containing 100 normal units. The bottles will hold 5 grammes (=500 units), which must be dissolved for use in 45 grammes of water. This dose is sufficient to treat tetanus in men as well as in horses. Intravenous injections are of a prompter action than subcutaneous. The surgical treatment is, however, not to be neglected. 2. A solution of antitoxin, 1 c. c. of which contains 5 normal units. It will be issued in bottles of 5 c. c., and from 0·5 to 5·0 of this fluid are to be injected when the outbreak of tetanus is expected. The dose will depend upon the time which has elapsed since the injury. For prophylactic purposes—for instance, before the performance of castration in animals—0·2 gramme is sufficient. To avoid putrefaction a small quantity of carbolic acid has been added to each bottle of the remedy. The dry preparation, which remains sterile in well closed bottles, contains no antiseptic. Dr. Behring points out that the doses may, perhaps, become modified after clinical experience. It will be the task of veterinary medicine to determine the right doses.

"THE QUEEN OF FLOWERS."

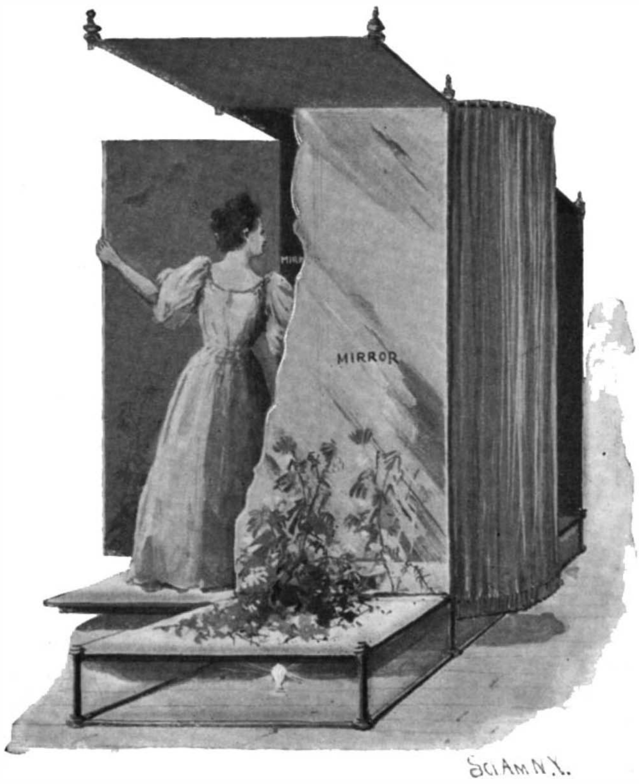
BY STOWE PHELPS.

Although the name of Herrmann is synonymous with all that is marvelous and supernatural in this matter of fact age, and his great fame, so justly won, has placed him at the top of his profession in the eyes of the American public, yet there is another magician who, though less widely known, stands side by side with the great Herrmann, and even surpasses him in the cleverness of conception and execution of many of his tricks and illusions. We refer to Mr. Harry Kellar.

One of Mr. Kellar's illusions, given at Daly's theater last spring, is what he is pleased to call "The Queen of Flowers." Fig. 1 represents the stage as the audience sees it, and the plan below will help to explain it to the reader. The background set against curtains is about ten feet long and eight feet high, and represents a mass of flowers and bushes indiscriminately thrown together, with blue sky above. There is a little flat roof which projects out about three feet from the top of the screen and is supported by four red poles. The bottom is a floor raised about a foot from the stage, and in front of each of the three divisions made by the poles between the stage proper and the floor of this improvised summer house is placed an electric light. The audience usually wonders what these lights are for in this strange place; but as audiences always accept anything shown them by a prestidigitator, these lights do not disturb them very much except by dazzling them, as they are meant to do. So much for the setting. There being no doors or screens or curtains of any kind, the spectators have the satisfied feeling that there is no deception there, for they can see all there is to see. They can, that is true, only they don't realize how much they are seeing.

Mr. Kellar next brings a semicircular stand which he places in front of the middle panel at the height of the floor. At the roof is fixed a brass rod in the form of a semicircle, from which hangs a curtain inclosing the little stand. This, however, cannot do much good, for, as Mr. Kellar says, those on the extreme right and left of the audience can still see quite behind the curtain through the summer house, and they believe him, not only because he told them so, but because they can see with their own eyes. What could be more convincing! In a moment the curtain is withdrawn and a beautiful lady surrounded by flowers is seen standing on the little platform.

Reference to the plan again will explain matters. The two dotted lines extending from the two center poles straight back to the background represent double mirrors; that is, each mirror consists of two mirrors back to back, running from the floor to the roof of the summer house. On account of the indefinite arrangement of the flowers painted on the back scene in monotonous design, the spectators do not notice the mirrors. These, of course, form a passageway through which anyone can walk from behind the scenes to the stand behind the curtain, while the audience is still keeping guard with its ever watchful eye.



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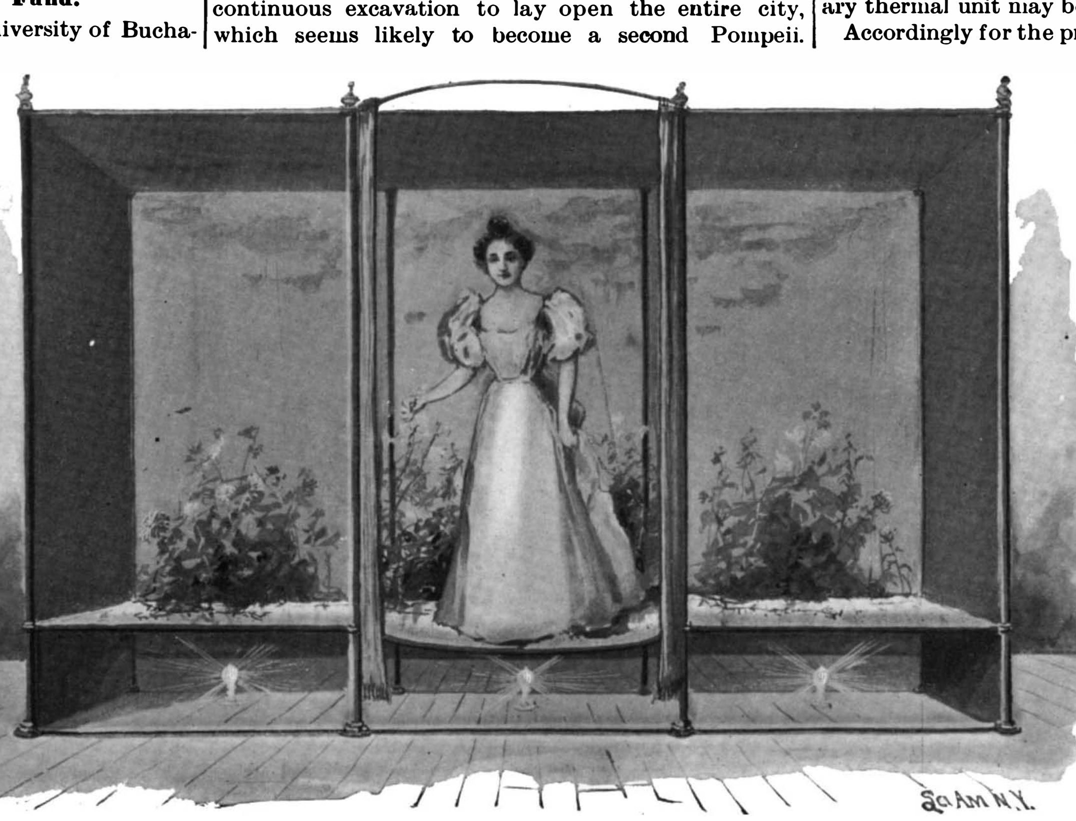

MR. KELLAR'S ILLUSION "QUEEN OF THE FLOWERS."

A Roumanian Pompeii Fund.

Prof. Gregoire Tocilesco, of the University of Bucharest and chief director of the National Museum, has recently visited western Europe on a mission for the Roumanian government to the principal scientific and archæological societies, says the London Times. At the recent congress of the Royal Archæological Institute at Canterbury, the professor gave an account of his researches in the Dobrudsha and of the extensive excavations which he has carried out during several years. The most striking results of his labors include the identification of the ancient topography of Lower Mœsia; the discovery of three great lines of fortification running across the province; the collection of over 600 ancient inscriptions, and the excavation of a considerable part of a buried city, Tropæum Trajani, now Adamklissi, which is situated about fifteen kilometers to the south of Rassova. It was one of the most important places in that region, attained municipal rank, and became the chief garrison of the frontier. A few years ago all that was known of it may be described as heaps of ruins, which included a great tumulus of masonry; its name even was unknown. By some it was regarded as a Persian monument of the age of Darius; others supposed it to be the tomb of a Roman general or of a Gothic chief. These conjectures have now given place to certainty, Prof. Tocilesco having unraveled the history of the site and laid bare some of its most remarkable buildings. His plan indicates a city of 10½ hectares in area, surrounded by walls adapted to the variations of the surface, and with 36 towers or bastions, of which 12 have been already uncovered. Three gates are visible, two larger ones east and west, and a postern on the south. The principal street is paved with slabs of stone and has central channels, one for the water supply, the other for drainage. Right and left of the main street were ranged great buildings—here a basilica (in the classical sense), there a Byzantine basilica with a crypt under the altar, and containing a fine mosaic. There are proofs that the city had been reconstructed, as stones bearing inscriptions had been re-employed as building material. Further evidence of this has been found in the inscription of a trophy which dates from the year 316, and furnishes information as to the history of the region. The city was founded by Trajan, received municipal rights toward the close of the third century, and was probably destroyed by the Goths. The Emperor Constantine and his associate Licinianus fought the barbarians and "reconstructed the city of Tropænsium from its foundations." The tropæum, of limestone, 2·65 meters in height, was the memorial of the victory, and served as the arms of the city. It will require several years of continuous excavation to lay open the entire city, which seems likely to become a second Pompeii. Thanks to the labors of Prof. Tocilesco, the great tumulus has ceased to be an enigma: its epoch and motive have been revealed, and the splendid monument of which it incloses the remains has been described and figured in a monograph by the discoverer. It may be briefly described as a gigantic trophy erected by the Emperor Trajan, after his victory over the Dacians in the year 108–9. It was dedicated to Mars Ultor, and its architect was the famous Apollodorus of Damascus.

During the present year Prof. Tocilesco has discovered and excavated another monument which is unique in the ancient world. It is a mausoleum erected by Trajan to commemorate the soldiers who fell in a battle near the spot, in which the emperor himself took part. The monument is quadrangular, on a platform of five or six steps, and bore plaques covered with inscriptions recording the names of the Roman citizens, the legionaries, and even the peregrines who fell in a battle near the spot. The inscriptions are full of interest and contain details of the domus or of the domicile of the Roman soldiers and of the countries to which the strangers belonged. M. Tocilesco gave a most interesting description of the principal inscriptions and of the light which they throw on the history of the buried city. He suggests that the great trophy was erected by Trajan at Adamklissi, although the war mainly took place north of the Danube, on account of the emperor's own presence at the opening battle near that spot, and within the three lines of defense. This battle is indicated in the Trajan column. The mausoleum appears to have been in the form of a pyros such as seen on the medals of Antoninus Pius and Julia Domna. In concluding his discourse the professor said that these excavations, which are being continued without interruption, are of the utmost interest to Roumanians, as they bring to light long buried memorials of the birth of their nation and of the Roman soldiers who sacrificed their lives in its behalf.

The International Thermal Unit.

At the recent meeting of the British Association the electrical standards committee provisionally approved a set of propositions relating to a thermal unit, and for the purpose of inviting international discussion of the question, proposes to send a copy of the propositions to representative bodies throughout the world. These bodies will be invited, says the Electrical World, to take what action they may deem most desirable, with the view to bringing about international agreement on the matter. The propositions are as follows:

I. For many purposes heat is most conveniently measured in units of energy, and the theoretical C. G. S. unit of heat is 1 erg. The name joule has been given by the electrical standards committee to 10^7 ergs.

For many practical purposes heat will continue to be measured in terms of the heat required to raise a measured mass of water through a definite range of temperature.

If the mass of water be 1 gramme and the range of temperature 1° C. of the hydrogen thermometer from 9·5° C. to 10·5° C. of the scale of that thermometer, then, according to the best of the existing determinations, the amount of heat required is 4·2 joules.

It will, therefore, be convenient to fix upon this number of joules as a secondary unit of heat. This secondary thermal unit may be called a "calory."

Accordingly for the present a second proposition is:

II. The amount of heat requisite to raise the temperature of 1 gramme of water 1° C. of the scale of the hydrogen thermometer at a mean temperature which may be taken as 10° C. of that thermometer is 4·2 joules.

If further research should show that the statement in II is not exact, the definition could be adjusted by a small alteration in the mean temperature at which the rise of 1° takes place. The definition in 1 and the number (4·2) of joules in a calory would remain unaltered.

Austrian Patents.

In 1895 the number of Austrian patents taken out, says a correspondent, was 5,215. Of the patentees, only 2,031 resided in the Austro-Hungarian monarchy. Among the foreigners, citizens of the United States are second only to Germans, the numbers being 335 and 1,950 respectively. Great Britain comes third with 313 Austrian patents, and France fourth with 243. Switzerland makes a very good showing with 79 Austrian patents. No other nation secured more than fifty patents in Austria.—La Propriété Industrielle.

RECENTLY PATENTED INVENTIONS.

Engineering.

SMELTING FURNACE.—Herman Huber, Kansas City, Mo. This invention is for an improvement designed to facilitate the working of smelting or stack furnaces with less draught, the gases being caused to rise uniformly and pass to the downtake flue with comparatively little resistance, whereby the loss of precious metals in the fumes and flue dust is reduced to a minimum. The invention consists principally of a removable hood adapted to be set on the top of the stack and provided with a flue for connecting with the downtake flue separate from the stack. The feed floor is not obstructed, and the comparatively low hood takes up but little room and does not interfere with the draught of the furnace.

STEAM BOILER TUBE CLEANER.—John H. Voorhees, Brooklyn, N. Y. This is a tool in which a tube is arranged to be fed through a conducting sleeve, and has opposite openings through which are fed cutters, a tapering expanding device working between the shanks of the cutters. The tool may be loosened within the tube, and its cutting edges may be brought into greater or less contact with the inner surface, not only for the purpose of removing the scale, but to the extent, if desired, of removing a shaving of metal from the interior of the tube. The tool is readily fed lengthwise of the tube at the desired speed, and the adjustment of the cutting portion of the tool is easily effected.

Railway Appliances.

EXTENSION CAR STEP.—Samuel J. Evans, Elkhorn, West Va. This invention provides an extension step which may be conveniently folded, when not in use, under the usual platform step of the car. On the outside of the risers of the fixed step are hangers carrying bearings for hubs on brackets carrying the extension step, a swinging arm engaging a locking bolt to lock the pivoted step in lowered position, or to fold it under the fixed step, either operation being effected by the movement of a hand lever on the car platform.

NUT LOCK. — Townson Hand, North Vernon, Ind. This is an inexpensive, easily applied device by which to securely lock the nuts of rail joints and of bridges, vehicles, etc. The nut is provided with seats in the form of an annular groove for a locking plate, and this plate has a crimped or bulged portion whereby a plate may be lengthened by hammering, and also providing for the introduction of the hook of an anchor plate. In using the improvement on fish plates, the locking plate is locked in position by an anchor, having a hook engaging the plate and a base portion spiked to the tie.

Electrical.

ARC LAMP.—John Rae, New York City. A lamp in which the light will be principally thrown downward, without casting shadows of the carbon or lamp frame, has been devised by this inventor, a spark arrester being also provided to prevent the escape of sparks and small pieces of hot carbon. The lamp frame has a holder which supports a transparent or translucent chimney inclosing the adjacent ends of the carbon rods, the chimney top being also supported by the lamp frame with an intervening air space. An outside flaring shade and reflector throws the light downward and under the center of the lamp.

STREET VENTILATING FAN.—Vespasian V. Hedges, Coffeyville, Kansas. This invention contemplates motor casings revoluble upon posts at the intersection of streets and alleys, and in electrical communication with a central power house, there being fans on a shaft driven by the motor, and means for making and breaking the circuit by the rotation of the casing on its support. Means are provided near the bottom of each post for turning the fans in the line of the street in the direction in which it is desired to create the current of air.

ELECTRIC CONDUIT RAILWAY SYSTEM.—William L. King, Winston, N. C. According to this improvement the main current conveying wire is preferably embedded in a suitable cement packed in the bottom of a conduit, and above the cement, within the conduit, are two working conductors arranged in sections of suitable length, insulated from one another at the ends, the top of the conduit having a longitudinal slot for the passage of a spring trolley connection with the motor on a car. Electro-magnets and armature levers are employed to direct the current from the main wire to the working conductors, and the arrangement is such that the current passing through the car motor is under the complete control of the motorman.

Mechanical.

LOOM HARNESS.—Joseph Hampson, Fall River, Mass. In looms for weaving figured goods, more especially leno muslins, usually woven with several harnesses, this inventor has devised an improvement in the construction of the leashes and the doups, to prevent the frequent breaking of the doups, and the consequent loss of time and material in making repairs. The improved doup apparatus consists of a series of plates having middle apertures through which the doups pass, and having a warp thread ring attached to their looped ends, leashes securing the plates and the heddle frames, to one of which the ends of the doups are attached.

CAN SOLDERING MACHINE. — Nelson Troyer, Astoria, Ore. This machine is especially designed to solder the ends of elliptical or oval sheet metal cans, the parts, when properly assembled in a hopper, being automatically fed to and secured on chucks connected with an endless carrier. The cans are then conveyed to a suitable flux and turned thereon to present the entire edge to the flux, after which they are raised and carried to a receptacle with molten solder, in which they are turned as in the flux, the soldered cans being finally automatically discharged from the machine. The chucks are adapted to enter an empty can for the soldering of one end, but in the case of a filled can its outer surface is clamped to effect the soldering. The machine is designed to solder twenty thousand cans in ten hours, with but two attendants.

PUMPING POWER.—George M. Carter, John H. Drew and Charles L. Drew, East Prairie, Mo. This is a machine in which there is a chain of gearing between the motor and a pump rod operating crank, and the governor comprises a rotary hollow shaft operated by the gearing, there being, on the upper end of the shaft, a frame to which angle levers are pivoted. A shaft connecting with the angle levers extends through the hollow shaft, and a brake lever is pivoted at one end to the machine frame and at the other end to the lower end of the shaft, a friction wheel on a gear shaft engaging with the brake lever. A lever pivoted to the machine frame has at one end an adjustable weight, its other end having a link connection with the brake lever. The machine is designed to be operated by a falling weight, giving considerable power and a regular rate of speed.

Agricultural.

HARVESTER AND BINDER.—Robert P. Lockhart, Patoka, Ind. This is a machine to be drawn or pushed by a traction engine, a number of very wide swaths being cut as the machine moves across the field, and the grain, after binding, being deposited in line on the ground at the side opposite the reapers. The main frame of the machine supports reapers which successively increase in lateral projection, and binder tables to receive the cut grain therefrom, carrier belts receiving the bundled grain from the tables, and the conveyers of each machine being graduated in length so that the sheaves may be delivered in alignment.

PLOW.—Richard H. Purnell, Rosedale, Miss. This invention is for an improvement in plows which carry a sweep or scraper, and provides for adjusting the sweep, in a simple and practical way, to any desired depth. The plow standard has a curved series of holes in its rear portion, and a pair of side bars pivoted at their front ends to the front lower edge of the standard have at their rear ends a clamping bolt passing through one of the holes of the standard, the sweep or scraper being rigidly attached to the front ends of the side bars and adjustable with them. The angle of the sweep and the altitude of its front edge may be readily changed without any adjustment of the clevis, harness or other appliances.

HARVESTER SHOCKER ATTACHMENT.—Mary R. Huber, Marysville, Kansas. This invention provides a car or truck adapted to travel at one side of the harvester, there being on the truck receptacles to receive bundles or sheaves and deliver them in upright position on the ground to form a shock, the receptacles being operated from the harvester platform or a point near the driver's seat. The mouths of the barrel-like receptacles are on the side that faces the elevator or conveyer frame, and while a lower receptacle is being filled another is in an upper horizontal position and contains a number of sheaves, the sheaves of the latter receptacle, as it is carried downward, being delivered on end to the ground, where they will stand upright to form a shock of considerable size.

COTTON CHOPPER AND CULTIVATOR.—John Cocke, Greensborough, Ala. A dragging cotton chopper frame, according to this invention, is made in triangular form, with cotton chopping hoes or sweeps along its front edge and in a row at right angles to the line of draft, an axle with supporting wheels being arranged along the front edge and above the chopper frame, while chains adjustably connect the chopper frame to the running gear and adjust its front edge vertically. A supporting wheel and handles are arranged at the rear apex of the triangular frame, the machine being designed to cut away a portion of the cotton plants in a row, to leave them in hills, and being converted into a cultivator with but slight changes.

HAND PLANTER. — John F. Ganson, Lodge Pole, Neb. For depositing young plants in the ground, this inventor provides a simple and inexpensive implement which has a spade point and a shoe with movement to and from the point, the shoe being connected with the receiver or reservoir in which the plant to be placed is introduced. The shoe has a foot to engage the ground and act as a gage and as a trip for the shoe, placing the shoe in such position, when the spade has entered the ground a proper distance, as will admit of the plant conducted by the receiver entering the opening prepared to receive it. As many receivers are employed as there are shoes for each implement, all being attached at their upper ends to the handle portion of the planter and pivoted at their lower ends to the spade stocks.

Miscellaneous.

BICYCLE REST.—Lewis Smith, Brooklyn, N. Y. To hold the bicycle in an upright position when the rider has dismounted and to lock the pedal cranks to the frame in such manner that the bicycle cannot be used until the rest has been detached from it, this inventor provides a device which may be carried in the pocket or about the person. It is preferably made in two sections of stout wire, the links of the two sections playing one upon the other and being connected by a clamp, the rest being so made that it can be readily lengthened or shortened and quickly locked to the frame of the wheel, a padlock being employed to secure the keeper over the head.

BICYCLE BEARING.—Edward A. Green, Battle Creek, Mich. A bearing from which dust is thoroughly excluded and dispensing with oil holes has been designed by this inventor. A spring-controlled washer is used in connection with the ordinary bearing, the washer closing the space between the cup and cone of the bearing. The washer is so placed as to admit of a lubricating material being introduced directly into the space in which the balls of the bearing are placed, and an oil can with slightly curved spout may be employed to introduce oil directly into the ball chamber of the bearing by pressing the washer outward or away from the outer edge of the cup, and introducing the spout into the space.

TOBOGGAN. — Harry P. Herron, Los Angeles, Cal. The body of this toboggan may be of the usual form, and at its ends are downwardly inclined spring arms in which are improved ball bearings carrying a roller at the front end and one at the rear end. A steering shaft connects the forward set of arms, whereby the toboggan may be steered by a hand bar, or this steering gear may be locked and the toboggan steered by the foot of the operator from the rear.

TIRE FASTENING.—Angus McI. Williamson, Philadelphia, Pa. This invention provides means for securing rubber tires to the fellies of vehicle wheels in such way that the fastening of the tire will not cut or destroy the rubber. A band secured to the felly has outwardly projecting side flanges in which the rubber tire is seated, and a rod passed through the tire is connected at its opposing ends by a loop bolt whose shank is passed through the band and felly and made fast by a nut and washer.

GAS REGULATOR.—Myron J. Amick, New York City. To regulate the pressure and flow of gas through the supply pipes of buildings, this inventor has devised a regulator in which the valve controlling the gas supply is capable of seating itself perfectly even when the regulator is considerably out of plumb. The valve is a double valve, the main valve having a lateral movement upon its stem and adapted to be seated against the wall of the inlet opening of the regulator, while the second valve seats itself against the main valve to prevent the passage of gas. The regulator has a mercury seal, but air may be admitted in suitable quantities without danger of the mercury leaking.

WASTE OIL PURIFIER.—Rudolph Metz, Philadelphia, Pa. This purifier consists of a circular tank in which are hot water columns so distributed that the oil will receive a warm and gentle heat throughout the entire area of the tank, but will in no way be brought into contact with steam coils or other medium for supplying the heat. The tank has a double bottom, the heating connections of the columns being made below the upper bottom. In the top of the tank is a pan and strainer into which the waste oil is poured, the purified oil being drawn from one or more faucets at different heights on the exterior of the tank.

SEWING MACHINE FAN ATTACHMENT.—Berthold E. Meyer, Springfield, Mo. This is a simple and inexpensive device, not liable to get out of order, and readily attachable to the flywheel of a machine. The invention consists principally of a slotted ring-shaped frame having apertured bosses, and hook bolts in the slots of the frame to engage the spokes of the flywheel while fan wings have shanks which engage the bosses, to which they are secured by set screws, the fan wings being readily set at any desired angle.

WHEAT STEAMER.—Nathan C. Blackburn and Edgar E. Howell, Fairbury, Neb. This is a steamer of simple and inexpensive construction, in which the grains of wheat passed through will be thoroughly steamed and heated by the action of steam without wetting the wheat. The steamer has channels or ducts for the passage of the wheat, steam jets acting in the channels on the wheat during its passage, and the channels being enlarged where the steam jets are located, so that sufficient room is given for the wheat to be thoroughly and uniformly surrounded and steamed.

TYPE BINDER. — Joseph Seide, New York City. This is a simple device designed to save time and labor, as compared with the usual method of tying up small jobs with a string. The invention provides for the use of side bars in which are longitudinal beveled channels, with an outwardly extended opening at the ends, while end bars have lugs engaging in the channels of the side bars, and have projections to engage the beveled portions. The binder may be locked up with the job, and it is practically impossible for the type to become loose or fall out.

UMBRELLA RIB AND STRETCHER. — Daniel H. Redmond and Chalkley B. Baldwin, Philadelphia, Pa. This is an improvement on a formerly patented invention of the same inventors, providing for a recessed rib with interior head and peculiar clip, making it possible to locate the pivot connecting the stretcher to the rib within the recess without weakening the rib by letting the pivot into it. The present invention simplifies the construction, reducing the space required for the insertion of the stretcher, and dispensing with the interior head and the necessity of a separate pivot, the pivot being formed integral with the clip. The construction is very simple and strong, and there are no small parts liable to get lost.

CLOCK STRIKING MECHANISM.—Henry Hall, Portsmouth, Ohio. This is a device particularly designed for use in Masonic lodges, to sound what is technically known as "low twelve." It provides for slowly sounding a gong or cathedral chime, and, when set in operation from the exterior of the casing, automatically makes the required number of strokes at the predetermined intervals apart. The casing is provided with sounding boards and posts arranged to produce an equalization of vibratory action, and the mechanism is automatically checked when the desired number of alarms have been sounded.

CAN OPENER.—John L. Haynes, Pawling, N. Y. This is a tool to be grasped and operated by both hands, without having to hold the can with one hand, it being practically impossible for the tool to slip from the can during the operation of cutting. It comprises two lever arms pivoted together, while a fulcrum arm extended from the pivot is adapted to engage the side of the can, there being a cutter on each lever arm, and the cutter of one arm overlapping that of the other arm.

BOTTLE SEALING DEVICE. — Andrew M. Cowart, Punta Gorda, Fla. This bottle has a breakable cap to fit over its neck, there being keyways in the cap and neck and an aperture in the cap in line with its keyway through which a non-removable key is inserted to lock the cap against removal, the key being preferably cemented in place. When the cap is thus fastened in place its top must be broken off to reach the cork, so that the contents of the bottle may not be removed and replaced by substitutes without detection.

ROTARY WATER METER.—James G. Summers, Charleston, West Va. In this meter a revolving hub is arranged within an outer casing and carries on its outer periphery hinged pistons or wing valves which are opened outwardly at the inlet for water, the pressure of which causes the hub to revolve until they come to the outlet, when they fold inwardly in moving past the abutment between the inlet and the outlet ports. This meter is designed to be simple, durable and accurate, starting of itself when the water is being used, registering exactly the amount of flow, and stopping when the use of the water is discontinued.

DEMONSTRATING FINANCIAL PROBLEMS.—Oliver Elison, Concord, Neb. A device designed to facilitate an explanation of the meaning of bimetalism, ratio, silver and gold monometalism, etc., has been devised by this inventor, and consists of a frame in which are pivoted two plates, representing gold and silver, having openings over which are located windwheels, with latches to hold the wheels in the same plane or at an angle to the frame. The free circulation of the wheels of the two plates represents the parity of the metals, but when the silver plate is brought into the wind the device represents gold monometalism. The vane which controls the device represents the government controlling money.

TEMPERING AND TOUGHENING METALS.—Zachriah T. Clark and Jonathan R. Neill, Portland, Oregon. This invention is for a liquid compound in which are linseed oil, sweet oil, sulphuric acid, blue vitriol, common salt and unslaked lime, in which a heated metal to be tempered and toughened is immersed for a few seconds, the compound being designed to act without checking or warping the metal, and give a uniform temper without trouble or mistake.

TANK HEATER. — Andrew W. Johnsen, Peter T. Herreid, and Thomas Herreid, Blair, Wis. For heating water, cooking feed, etc., these inventors have devised a heater to be set in a tank and effectively heat the surrounding substances without any appreciable loss of heat. The casing of the heater has a double top and in its lower portion is a combustion chamber, at one end of which is a draft channel leading down from the top, while at the other end is a chimney set in a thimble in the double top. There is a manhole in the top for the introduction of the fuel, a cover fitting the manhole at its lower and upper ends.

MERRY-GO-ROUND.—William X. Simpson, Aurora, Ill. This improvement combines the motion ordinarily obtained in this class of apparatus with a see-saw motion, designed to obviate the dizzy sensations caused in many persons by the rotary motion. The vertically rotating shaft with which are connected the inner ends of the car-carrying arms is surrounded by a bed in which are segmental cam grooves, and guide bars connected with the arms are adapted to travel in the cam grooves of the bed.

COMMODE.—Cora G. Mann, Brooklyn, N. Y. This is a device adapted for attachment directly to a bed and having a seat which may be adjusted vertically as desired, its back being placed at an angle to or parallel with the side board of the bed, and the device being so arranged that the patient may pass from the bed to the commode without exposure.

Designs.

HANDLE BAR.—Robert W. Murphy, New York City. This bar extends centrally upward, then laterally, and then downward and rearward, the central side portions and the ends both having hand grips.

TOE CLIP FOR VELOCIPEDES.—David Basch, New York City. This clip is return-bent and tapered, presenting a wide opening at the bend, and the bent members at the sides of the opening having diagonal corrugations.

FRAME FOR DRILLING MACHINES.—Foster Milliken, New York City. Two patents have been granted this inventor for different styles of frames, one with a cruciform base and the other substantially rectangular, both moved about on roller supports and both having bicycle saddle-like seats and handle bars for the operator.

COLLAR. — Herman Rosenthal, New York City. This design is for a collar apparently separated into two divisions, one formed of plaits in regular ruching order, while in the other the plaits are longer and are graduated in length from the center to the ends of the collar.

NOTE.—Copies of any of the above patents will be furnished by Munn & Co. for 10 cents each. Please send name of the patentee, title of invention, and date of this paper.

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PHOTOGRAMS OF THE YEAR 1896. A pictorial and literary record of the best photographic work of the year. London (England): Dawbarn & Ward, 6 Farringdon Avenue. Pp. 112. Price $1.

A very interesting pictorial compilation of the best work made known in 1896, as exemplified in the several exhibitions in England, the United States, and other countries. Besides this, there is an excellent literary review of the pictures.

The first portion of the book contains a review of the technical progress in 1896, describing the discovery of X-ray photography; then follows a review and full page illustrations of some of the most important pictures of the year, including the works mostly by English photographers. Another section is confined to "Pictorial Photography in the United States, 1896," by Alfred Stieglitz; still another to "Photography in Canada," by Eldgridge Stanton. Also a portion on "Photographic Advance in Australia, 1896," by W. F. Ponder. The latter half of the book contains articles on "The Great Exhibitions," criticism by Gleeson White, with notes by a technician. There are fine examples of portraiture, landscapes, marine views, figure composition, interiors, and genre work. The idea of the book is excellent, since it places before one's view the latest pictorial progress by the best workers. We commend it to the attention of all photographers and others desiring to keep in touch with pictures of the times. The book is admirably printed; it is also well edited by the editors of the Photogram.

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Machine Wipers of Raw Silk.—At the recent Profile House meeting of the New England Cotton Manufacturers' Association testimony was given showing the value of silk machinery wipers, as compared with the usual combustible waste. Many leading railroads have adopted the silk wipers and the agents of several large mills are investigating them. The American Silk Manufacturing Company of Philadelphia, the largest manufacturers of raw silk machinery wipers in America, report that the percentage of converts to the clean non-combustible raw silk wipers is largely in excess of that continuing to clean machinery in the old way. These wipers are washable and will not injure the finest parts of machinery.

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Notes & Queries

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(7046) P. R. L. writes: 1. I have a small storage battery. When charged it will light a 4 volt (Fairy) incandescent lamp for two hours. Please let me know how I could connect the storage cell to a 110 volt incandescent circuit (two lamps in use on the circuit now). A. Put it in circuit with one or two incandescent lamps. Charge until gas is evolved. 2. Could I charge the cell to light the lamp longer, by leaving it in the charging circuit longer? A. If of good construction, the battery should run for ten hours; possibly it cannot be made to run on capacity of your lamp over the two hours. 3. Let me know what dry solution is used in place of sulphuric acid and water when battery is to be used in a wagon, etc. A. No dry solution is used. Cover it hermetically.

(7047) A. W. says: In your answers to Notes and Queries in the Scientific American will you please give me modus operandi and formula for cleaning soiled sheepskin that has been tanned white? A. One washing with warm (not hot) suds will not materially hurt the skin itself. The skin may not seem quite so soft after the washing, but if the washing is done quickly, the skin well rinsed in cold water, and dried with only moderate warmth, being frequently turned and shaken, the difference will hardly be perceptible.

(7048) G. E. B. asks what the depolarizing compound used in most carbon cylinder batteries consists of. A. A mixture of carbon lumps with manganese binoxide (black oxide) out of which the dust has been removed by sifting is a good mixture; 4 parts of manganese to 5 or 6 parts of carbon may be used. In the agglomerate Leclanche the formula is.

Manganese binoxide	40 parts.
Carbon	52 "
Gum lac	5 "
Potassium bisulphate	3 "

(7049) A. C. S. asks: Please inform me how to prepare a very energetic exciting fluid for small tumbler battery. What size wire shall I use to connect the cells, and for connecting to a 6 candle lamp? A. Use water, 100 parts; potassium bichromate, 16 parts; sulphuric acid (66°), 37 parts. Use only when cold. Amalgamate the zincs. Use No. 20 or 22 wire.

(7050) H. A. L. says: Please send me a copy of your paper that gives instructions for polishing sea shells. A. Porcelainous shells are so hard as to require the apparatus of a lapidary to cut or polish them, but they are generally so smooth as to require no rough grinding. They may be polished by using a felt wheel and applying putty powder. Nacreous shells or those of the pearl variety may be filed and cut without a great deal of difficulty. Pieces to be turned are first roughly shaped on the grindstone, then turned and polished with pumice stone, putting on the final polish with rotten stone. Irregularly shaped pieces are filed and ground, then smoothed with pumice stone and water, and finished with rotten stone. The rotten stone is sometimes mixed with sulphuric acid full strength, or slightly diluted, to heighten the polish.

(7051) L. A. L. asks for the receipt for making fixatif used on charcoal drawings. A. 1. Two tablespoonfuls of rice boiled in 1 pint or 1½ pint of water; strain, and pass the drawing quickly through the liquid; use a large flat dish for the liquid. 2. Prepare water starch in the manner of the laundress, of such a strength as to form a jelly when cold, and then apply with a broad camel hair brush, as in varnishing. The same may be done with thin cold isinglass water or size, or rice water; very thin white shellac varnish applied with an atomizer answers well as a fixatif.

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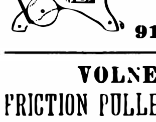

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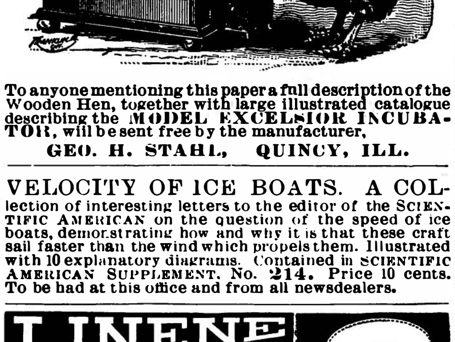

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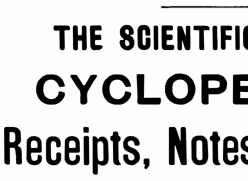

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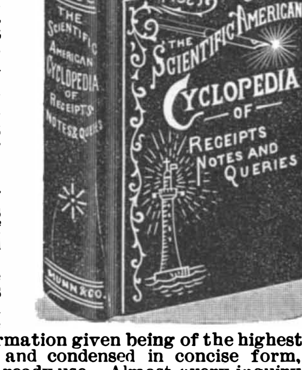

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