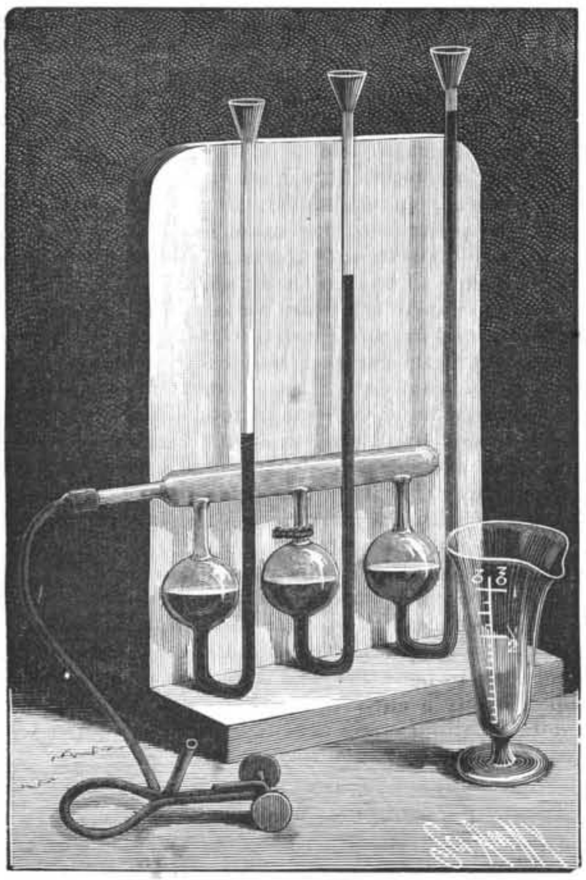
THE YACHT THISTLE.

This new yacht, constructed in Scotland with a view to competing for the world's prize cup, now held in New York, arrived at this port on the 16th of August, 21 days from Gourock Bay on the Clyde, whence she sailed July 25.

The vessel attracts much attention, and opinion is about evenly divided as to whether she will be able to



THE EQUILIBRIUM OF COLUMNS OF LIQUIDS OF DIFFERENT SPECIFIC GRAVITIES.

beat the Volunteer, the new yacht with which it is expected to compete for the great prize in October next.

We give from the *Graphic* several views of the Thistle as she appears in different positions. These are from photographs, and in connection with the large engraving given in the SCIENTIFIC AMERICAN of July 2 last, will give a fair idea of this remarkable vessel. In nearly all of the several races the Thistle has sailed in England she has been the winner. The following shows the dimensions of several of the fastest yachts, as given in the New York *Tribune:*

	Thistle.	Volunteer.	Mayflower.	Galatea.	Priscilla.	Atlantic.	Puritan.	Genesta.
Length over all....	112	107	100	100·6	95	95·1	93	96·5
Length on w. line..	85	85·10	85	86·10	83·3	83·4	81·1	81·6
Beam................	20.3	23	23·6½	15	22·8	23·10	22·6	15
Beam at w. line.....	20	22	22·3	15	22·2	23·2	21·6	15
Depth of hold.. ...	14·2	10	10	13·3	9·4	10·6	9·6	11·9
Draught............	13·8	10	10	13·6	9	9·10	9·3	13
Area mid sec........	15	96	92	125	92	102	88	115
Mid section bow...	......	0·60	0·60	......	0·60	0·64	0·58	......
Mast, d. to hou.....	62	65	63	53	61·9	63	60	52
Topmast	45	48	46	47	48	48	44	44·6
Boom..............	81·6	84	80	73	80	78	76	70
Gaff	50	52	50	45	48	48	47	46
Bowsprit outb......	38·6	37	38	36·6	39·7	38	38	36.6
Spinnaker boom ...	70	70	67	65·6	66	70	65	64
Displacement	135	116	110	157 6	115	120	102·5	140
Inside ballast......	10	10	14	6	47	15	12	5
Keel ballast........	55	50	37	72	......	47	32	68
Sail area...........	......	9,000	8,634	7,505	8,500	8,100	7,370	7,150

APPARATUS FOR ILLUSTRATING THE SPECIFIC GRAVITY OF LIQUIDS.

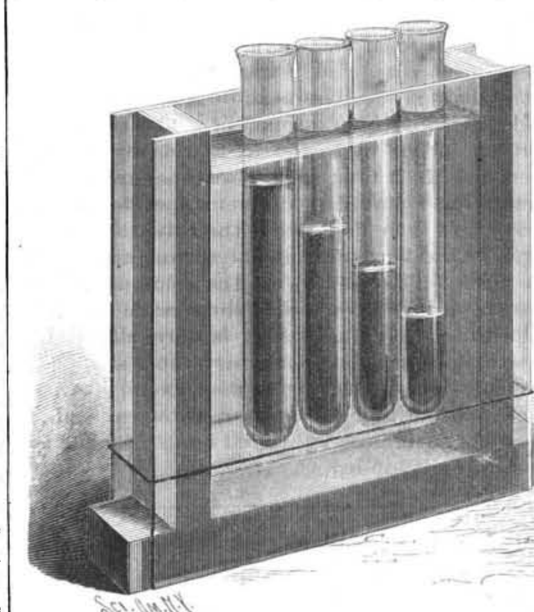
BY T. O'CONOR SLOANE, PH.D.

The law of the equilibrium of communicating columns of liquids of different specific gravities is that their height varies with their specific gravities. Thus a column of mercury one inch in height will sustain a column of water over thirteen inches high. This can be very easily illustrated by a bent tube, of the shape of the letter U. A little mercury is poured into the bend, so as to fill it. Then if water is poured into one limb it will rise thirteen times as high as the mercury, both measurements being referred to the surface of the mercury under the water as a base. Other liquids can be substituted for mercury. Although they may tend to mix with the water, the diffusion is so slow that the experiment can be performed with some satisfaction.

This arrangement is only adapted to show the experiment with two liquids. An apparatus is shown in the cut by which the same is illustrated for three liquids. The same apparatus can be made to show it for any number.

The glass portion is made in one piece. The horizontal tube may be one-half inch in diameter, the small bent tubes one-eighth inch internal diameter, and the bulbs, in this case, should then be at least one inch in diameter. The tubes from bend to top should be about seven inches long. This gives a small apparatus. With advantage it could be made very much larger. The great point to be kept in mind is that the bulbs should be eight or ten times the internal diameter of the tubes. The whole may be mounted on a simple wooden stand. One end of the horizontal tube is closed; the other is provided with an open extension of diminished size, so as to receive an India rubber tube. A pinch cock for closing the latter is provided.

Liquids of different specific gravities are now poured into the respective tubes. The upper ends of the latter are slightly expanded, so as to form little funnels. Enough liquid is poured into each to rise to or slightly above the center of the bulbs. The pinch cock is now opened and the experimenter blows into the rubber tube. The liquids at once rise in the tubes and sink in the globes. This rising and sinking is in exact proportion to their specific gravity. Owing to the large size of the bulbs, they sink in them very little compared to the amount they rise in the tubes. The effect of this is that in the bulbs they preserve almost an exact level with each other. But in their rising they vary widely.

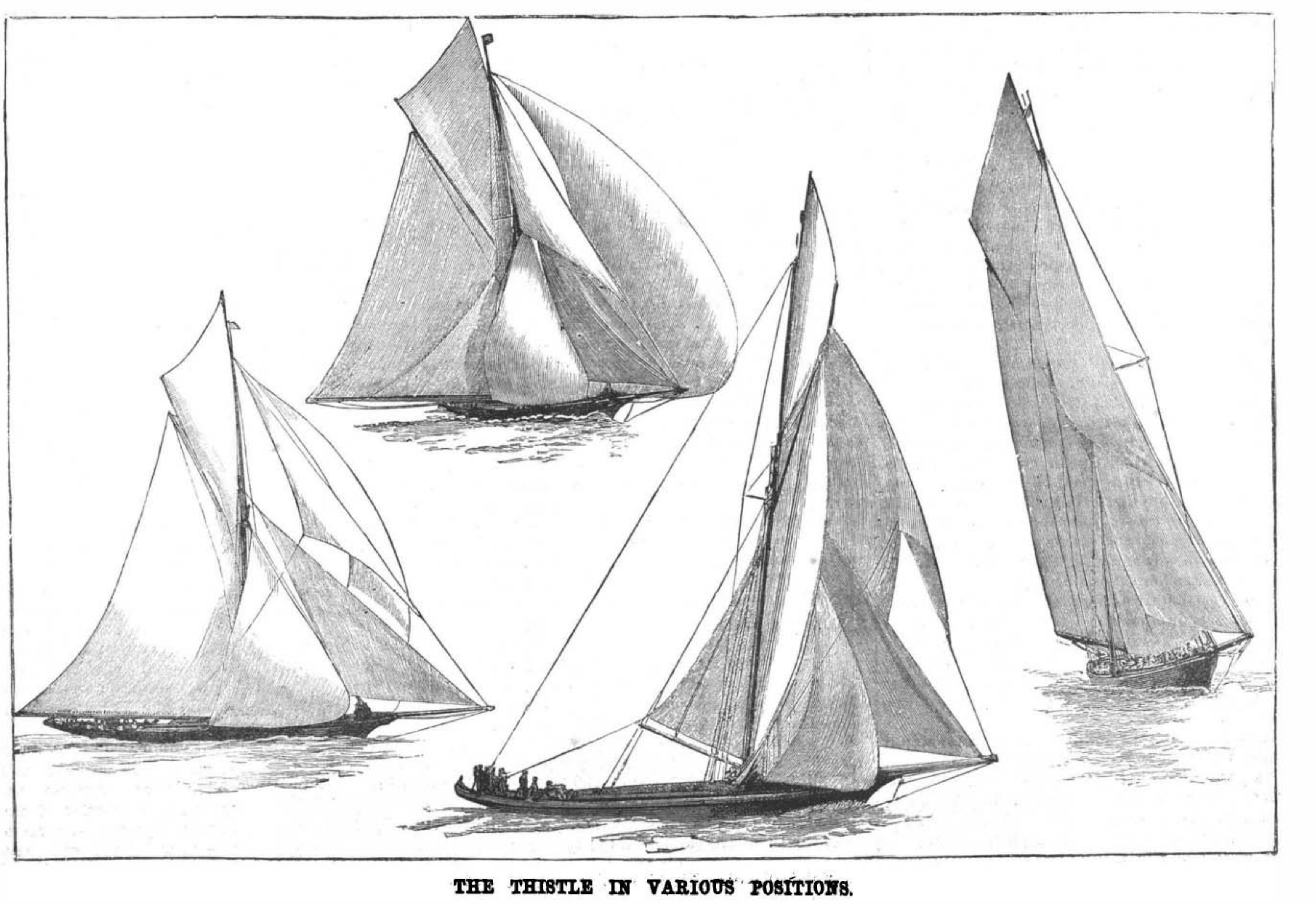


FLOTATION OF LIQUIDS OF DIFFERENT SPECIFIC GRAVITIES.

As soon as the lightest liquid reaches the top of the tube, the pinch cock is closed. Then the different columns remain stationary, all exerting the same pressure, though of different heights.

Concentrated sulphuric acid may be used as the heaviest liquid. It has a specific gravity of 1·84. By diluting it with varying amounts of water, lighter liquids may be produced, and water may serve for the other extremity of the scale, or alcohol may be used as a still lighter fluid. If a heavier fluid is desired, a solution of boro-tungstate of lime or of iodide of mercury in iodide of potassium may be used. The first of these may be made 3·6 times as heavy as water.

By making the apparatus smaller it will afford an excellent lantern slide. In this case it should not be mounted on a board, as shown in the cut, but may be held in a clamp or even in the exhibitor's hand in front



THE THISTLE IN VARIOUS POSITIONS.

of the condensers. While any number of tubes may be thus connected, it is as well not to have more than four or five, as the preparation of so many solutions of varying density involves some little trouble. To make it more effective, some coloring matter should be used in the fluids, and this should be made to vary in intensity as the fluids vary in weight.

In the next cut another experiment, illustrative also of the laws of the specific gravity of fluids, is shown. With two pieces of glass and some strips of wood a water-tight cell is constructed. The wooden strips may be printer's "furniture." A three-sided frame is made, and cemented at the joints with sealing wax. The sides of the wood are then coated with sealing wax and one piece of glass put in place and exposed to a very gently applied heat. When the wax is thoroughly melted the glass is allowed to cool, and the other side is treated in like manner. The cell should be about five inches high and four wide by internal measurement. In it four or five test tubes are floated, each containing a liquid of different specific gravity. They are adjusted to float with their bottoms on an exact line. A rubber band may be sprung around the cell as a mark. The heights of the columns of fluid contained by each will vary with the specific gravity.

This forms an exceedingly good lantern slide. The two experiments are complementary, and should be shown in succession. The test tubes should fit freely in the cell, and nothing lighter than water can well be used in any of them, as a light fluid tends to make the tube containing it top-heavy.

A Transformation of Light into Electric Energy.

Instances of the indirect transformation are not new to the physical investigator, and a record of one of the first is to be found in the now classic work on the correlation of the physical forces written by W. K. Grove (now Justice Grove) when he was a young man. Special interest, however, attaches to some recent experiments by Kalischer, in which he describes a selenium cell which, when exposed to light, gave a permanent electric current.

Before quoting the abstract of Kalischer's paper that appears in the *Journal of the Chemical Society*, we may say a few words in explanation of the nature of the physical organism known as a selenium cell. The selenium cell consists essentially of two conducting wires separated by selenium, and it has long been known that when such an organism is placed in an electric circuit, exposure of the selenium to light means a diminution of resistance, or, in other words, that selenium conducts electricity better when exposed to light, and in some sense this increase of conductivity is proportionate to the intensity of the light. Indeed, several proposals have been made to practically use a photometer based on this action of light on selenium.

In practice, the selenium cell consists of two metal wires coiled side by side on a cylinder of glass or other non-conductive material, care being taken that the two wires, though very close together, do not actually touch. A thin film of selenium is then melted over the whole, so that it runs into the interspaces between the wires, after which the cell is exposed to such a heat as shall bring the selenium into the best condition of sensitiveness.

Since the telephone has been a recognized instrument, Graham Bell has pointed out that when a selenium cell is exposed to rapidly recurring impulses of light, corresponding impulses of electricity circulate through the connected wires of the selenium cell; and special interest attaches to the present observation of Kalischer, as it may be one element in a train of discoveries which may lead to such a complete transformation of light into electric energy as shall be of practical advantage to mankind.

The abstract of Kalisher's paper, as we find in the organ of the Chemical Society, is as follows:

About the same time that Bell discovered that an intermittent exposure to light generated a current in selenium which affected the telephone, the author met with a selenium cell which, under the action of light, produced a current which could be detected by a galvanometer. As it appeared that those who have paid special attention to the preparatipn of selenium cells have seldom met with cells which were so sensitive to light, an attempt was made, in the first place, to discover the pr per mode of making such cells.

The cell consisted of two parallel wires wound round a stem with selenium melted between them. In order to insure the sensitiveness of the cell to light, it was heated to 190–195°, kept at this temperature for half an hour, and then allowed to cool for an hour. If at first not successful, a repetition of the process produced the desired result.

When such a cell is inserted in a galvanometer circuit and exposed to the action of light, there is a permanent deflection. It is found that the cells which are sensitive have a large specific resistance. To produce a current in general, a very intense source of light is necessary. The sensitiveness, and with it the specific resistance, were found in many cases to diminish with the time. The author believes that these facts are very well explained by the hypothesis advanced by Siemens, that there is a metallic modification of selenium.

Again, if a cell is placed in an arm of a Wheatstone's bridge and the balance obtained in the usual manner, on allowing light to fall for an instant on the cell there is a deflection, but the mirror does not return to its position of rest at once, and gradually creeps up to a fixed position. This is not due to the effect of heat, for it occurs even when the cell is shielded by an alum cell or by a current of water circulating round it.

It is proposed to call this phenomenon after-action, from the analogy it presents to other well-known physical facts. The analogy is traced out by showing that the after-action is dependent on the duration and the intensity of the illumination of the cell. It is also shown to be independent of the direction of the current.—*Photo. News.*

Dangers of Benzine.

Some weeks ago, in a Philadelphia music printing establishment, while a boy was engaged in cleaning a press with benzine, rubbing it with a rag, the fluid blazed up; the lad's clothing caught fire, and he was so severely burned that his recovery was stated to be doubtful. It has been popularly supposed that flame, or at least a temperature equal to the white or red heat of iron, was necessary to ignite benzine vapor, but, according to the *American Exchange and Review*, this is a mistake. "It is a fact little known," says that journal, "that hard friction can develop sufficient heat to inflame benzine vapor, especially if the surface rubbed be varnished with shellac. We are informed by a competent and truthful mechanical engineer that a few years ago, while trying with benzine, in a closed tin vessel, to construct a thermostat to ignite a powder giving out sulphurous gas in case of fire outbreak, he found that the vapor was leaking from a minute crack in a seam. He requested a tinman to solder the leak, supposing that a copper soldering tool at dark heat would not be dangerous. To his surprise and that of the workman, the vapor ignited, with a blue flame, as soon as the tool approached near the crack, and a flame played around the tool like a will-o'-the-wisp. This gentleman several times experimented afterward, and found that at a dark heat the tool did not inflame the vapor when at a distance of twelve inches from the crack, but did always set fire to it if within six to four inches. No matter how small the crevice, there always came out enough vapor to ignite at this low degree of temperature. In these trials, as in the first instance, the tinman's furnace was kept at a considerable distance." We mentioned a few months since a case in which this vapor was ignited by electricity generated in rubbing a flannel garment, which was being cleaned in a tub of the fluid. This last occurrence once more emphasizes the need of the utmost caution in the handling of benzine in the scouring and furniture establishments and printing offices in which it is so generally and extensively made use of.—*Fire and Water.*

A Green Lake Color.

Uranium oxide forms a green lake with the coloring matter of cochineal. This property may be utilized for giving the determination of phosphoric acid by uranium nitrate increased accuracy and precision. The preliminary operations are supposed to be conducted according to Joulie's citro-uranic method, *i. e.*, solution of the phosphate in hydrochloric acid, precipitation of the phosphoric acid by means of the citro-magnesian solution, and solution of the double ammonium magnesium phosphate in dilute nitric acid. At this point the author adds to the nitric liquid a few drops of infusion of cochineal (obtained by treating the cochineal with boiling water), and then, with a pipette, ammonia slightly diluted until a violet color is obtained. This is made to disappear again by acidulating slightly with nitric acid. The liquid is then heated to 100°, 5 c. c. of the acid solution of sodium acetate are added, and the standard solution of uranium nitrate is then dropped in with a burette. Each d op of the uranium nitrate produces a greenish blue spot, which becomes gradually stronger as the end of the precipitation is approached, and which disappears on stirring as long as this precipitation is not complete, leaving the rose color of the cochineal. At the exact moment when the precipitation is complete the liquid takes a bluish green color, which undergoes no further change on the addition of a further quantity of uranium nitrate. —*C. Mallot, Moniteur Scientifique; Chem. News.*

Artificial Production of Pilocarpine.

Messrs. E. Hardy and G. Calmels have succeeded in effecting the synthesis of pilocarpine. In a paper read before the French Academy of Sciences, they gave a full description of their process, which consists of two steps, first the transformation of pyridino-lactic acid into pilocarpidine, and secondly the transformation of pilocarpidine into pilocarpine. As the method is complicated, and must be expensive, since gold chloride is one of the chemicals employed, the new synthesis is no doubt important scientifically, but cannot be said to be a practical process.

Do Inventions Decrease Wages?

Among the men who are prominent agitators in industrial lines are many who explicitly assert that inventions and improvements in machinery are responsible for the decrease in wages so much talked about nowadays. The assertion is of course easily disproved by the fact that in comparison with wages in the old days before machinery came into general use, the wages of mechanics are higher in these days of machines of the highest excellence. The Illinois Central Railroad publishes a record of locomotive service for thirty years which has a strong bearing on this point. According to that record, which is given in *The Milling World*, the running cost for a mile has fallen from 26·52 cents in 1857 to 13·93 cents in 1886. This reduction has been effected wholly by inventions and improvements in machinery. But the figures show that the progress of invention has been even more remarkable than these figures imply, because the wages of engineers and firemen have risen in the same period from 4·51 cents to 5·52 cents per mile run. In 1857 the engineers and firemen received 17·201 per cent of total cost. In 1865 the engineers and firemen received 15·091 per cent of total cost. In 1867 the engineers and firemen received 20·865 per cent of total cost. In 1886 the engineers and firemen received 39·627 per cent of total cost. Demagogues may dispute these figures, adds our contemporary, but it is nevertheless true that improvements in machinery, not only in railroads, but in other important lines as well, are a benefit in every way to everybody concerned. The general public are better served at cheaper rates, and the mechanic receives increased wages. Those peculiar individuals who advocate a return to "good old times," who prefer hand work to machinery, and who preach that invention is really a curse to labor, should try to understand the situation. Cases like the one quoted will open their eyes.—*The Milling World.*

Shall we Plant Native or Foreign Trees?

An editorial in the September *Century* closes as follows: "We feel justified in adding to these general statements a word of strong recommendation in favor of native as against foreign, or at least as against European, trees. At the best, the latter are uncertain in almost every case, while the former have an inborn and a well-proved title to be trusted. The most successful ornamental planting that has ever been done in America shows its results in the streets of such towns as Stockbridge, Great Barrington, Salem, and New Haven, and was the work of men who went to the forest and not to the nursery for their infant elms and maples. Certainly our more recently planted parks offer small promise of a like maturity of beauty with their European oaks and ashes, their Scotch and Austrian pines, in almost as deplorable a state as their Norway spruces. When not ornamental but economic plantations are in question, past experience tells very strongly against European trees, while the evidence of recent experiment with native trees—as in the plantations of indigenous conifers in Eastern Massachusetts—is of the most encouraging kind."

Concrete Forts.

We see that experiments are to be made shortly at Lydd as to the capabilities of a concrete turret to resist the impact of modern projectiles. A concrete tower is to be erected and covered with thirty feet of earth. We described a short time ago what a scientific French general had recommended as the fort of the future. This was an oval fort of concrete, shaped like a dish cover, without a ditch or flanking works of any kind, and having a thickly plated iron cupola in the center, armed with two or three heavy guns, and with disappearing turrets for quick-firing guns. These masses of concrete are pretty nearly solid, covering subterranean barracks and store rooms, and they would require very small garrisons. We believe the Belgian defenses on the Meuse will partake something of this character. The heavy guns are placed in pairs parallel to one another in the turrets, and are turned away from the enemy when loading takes place—*Broad Arrow.*

Natural Gas in 1827.

In 1827 there lived in Washington County, Pa., a farmer by the name of McCook, an uncle, says the Pittsburg *Times*, of the famous General Anson G. McCook, the present Secretary of the United States Senate. McCook's farm was situated on the old national pike, eight or ten miles out of Brownville. In attempting to dig a well a short distance back from the pike he struck a large flow of natural gas. This by accident became ignited, and the flame it gave forth scared the horses passing on the pike, and many runaways occurred. This went on for some time, until the authorities in that section passed an ordinance stigmatizing it as a nuisance, and compelling McCook to suppress it as such, which he did. Thus what the citizens of Pittsburg now consider the greatest discovery of the nineteenth century, just half a century ago the citizens of Washington County considered the greatest nuisance.

The Meeting of the National Electric Light Association.

The sixth meeting of the above association was held in Boston, Mass., on August 9, 10, and 11. It was pronounced the most important meeting yet held, as it was the most numerously attended.

The president was Mr. J. Frank Morrison, of Baltimore, Md., who called the meeting to order at 10:30 A. M. of the first day. The place of meeting was the Parker House. In a brief address he reviewed some features of the progress of the last six months, and alluded to some of the promised papers to be read before the meeting. At the conclusion of his remarks he introduced Mayor O'Brien, of Boston. In brief but very felicitous remarks he welcomed them to the city. He noted the field for work they could find there in running street cars or small motors. Boston, he stated, had neglected small industries, and in electricity might be found the means of building them up.

The first business done was the presentation of the report of the legal committee on patent legislation. The report was presented by Mr. Arthur Steuart, of Baltimore. Its general tenor was in the direction of suggesting more thorough work by the Patent Office, so that the verdict of the office in granting a patent might be accepted as in some sense a guarantee of its legal force, so as to diminish litigation. The needs of the office in the way of a laboratory and of apparatus were also spoken of. The tenure of office, particularly of the commissioner, was declared unsatisfactory. While taking these and other somewhat radical views, a resolution was presented. The members were exhorted to use their influence with Congress to have it passed at the next session. This resolution provides for the appointment by Congress of a commission of three members, at an annual salary of $5,000, to study the requirements of the patent law, and to report thereon to Congress. The commission is to present to that body a draught of an act embodying what they shall decide to be desirable changes. Of this proposed action we shall speak elsewhere more at length. This report was followed by the report of the legal bureau, also presented by Mr. Steuart, its custodian. He announced that in the near future he hoped to be able to offer to the members the use of an analytical digest of patents and of the literature of electric lighting. The object of the proposed digest is to enable members to form some estimate of the scope and validity of new patents. Thirty-three serial publications were mentioned as drawn upon for this purpose. Mr. A. J. De Camp, of Philadelphia, presented the report of the committee on revision of the constitution. After discussion, the report was recommitted for the present. The report of the Committee on Wire Gauge was presented by Mr. A. V. Garratt. The difficulties of the subject were recapitulated both in the report and in the discussion which followed. A large table, entitled "Mathematical Properties of the Metric Wire Gauge," was presented in connection with it. This really valuable piece of work represents an immense amount of labor, embracing wire of diameter from 0·1 millimeter up to 10 millimeters, advancing by single tenths; in B. & S. gauge from No. 38 to 000. Eighteen columns of different factors and equivalents are given, both foot and pound as well as metric references being provided for.

The Committee on Proper Insulation of Wires and Proper Installation and Construction of Plants presented a preliminary report, followed by their resignations, as no funds were available for bringing the work to a conclusion. Mr. M. M. M. Slattery, of Woburn, Mass., then read the report of the Committee on Electrical Distribution by Alternating Currents. This, as our readers know, is one of the last developments in electrical engineering, and in the paper and discussion which followed its reading some very interesting points were brought out. One conclusion that would be considered rather remarkable was that shocks from alternating current were less to be dreaded than those from direct current machines. They tend to throw the person shocked away from them, and the burn is far less severe than that due to a direct current.

Electrical education was treated in a paper read by Mr. E. R. Weeks, of Kansas City, Mo. The Electric Light Outfit of the New Government Cruisers, by Lieut. J. B. Mudoch, U. S. Navy Electrician at the Torpedo Station, Newport, R. I., was a carefully prepared essay, stating the difficulties and conditions of the problem, and appealing to the electric engineers of the country to assist in its solution. Low-speed dynamos, coupled directly to their engine, were advocated. The use of the current for driving motors to actuate the loading machinery, etc., about the guns was recommended also. Several tables of dynamo constants, giving watts produced per pound and per square inch floor space by dynamos of different makers, were embodied in the paper.

Other papers were: On Bending Test of Wire and on Silicon Bronze Wire, by Dr. Leonard Waldo, of Yale College; on The Present Status of the Storage Battery, by Mr. C. O. Mailloux; and on Storage Batteries for Locomotion, by Prof. A. Reckenzaun.

The meeting finally adjourned on Thursday afternoon. Various social gatherings, excursions, and receptions by the Boston Electrical Club and other organizations characterized the progress of the meeting.

ON A MAGNETIC BRIDGE OR BALANCE FOR MEASURING MAGNETIC CONDUCTIVITY.*

BY THOMAS A. EDISON.

Perhaps no electric measuring instrument has proved more useful in practice, especially if we consider the

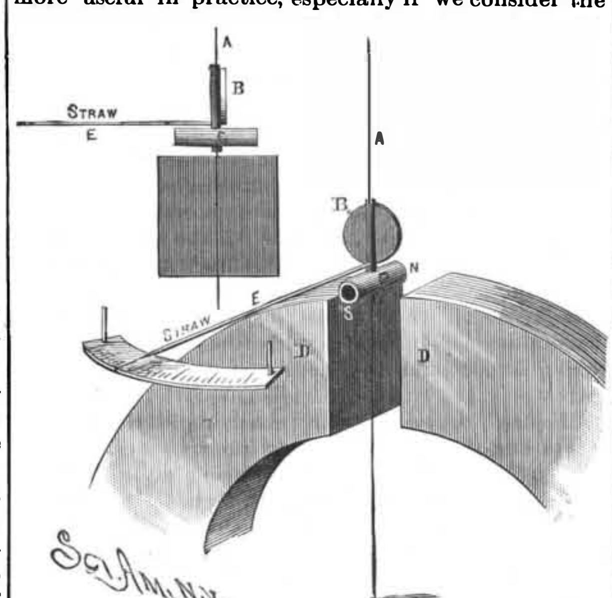


Fig. 2.—EDISON'S MAGNETIC BRIDGE—ENLARGED VIEWS OF MIRROR AND NEEDLE.

various forms which it has assumed, than the device contrived by Christie and commonly known as Wheatstone's bridge. It was with the belief that a similar instrument could be constructed which should perform the same service for magnetic measurements, that the experiments were made the results of which I have the honor now to present to the section.

The Wheatstone bridge is based upon the fact that if two points of different electric potentials are united by two conducting paths, the fall of potential along these paths is absolutely the same, provided that these paths are absolutely alike electrically. Consequently, if two points equidistant from the place of higher potential be connected together, no current will flow through the connecting wire. So, by analogy, if two points be maintained at a constant difference from one to the other through two or more paths the magnetic potential will be absolutely uniform in all, provided these paths be magnetically identical. Hence, at any two points equidistant from a given terminal, the magnetic potential is the same, and these points would be without differential action upon a magnetic pole.

The magnetic bridge may be constructed in the form of a rhomb, the typical form of the Wheatstone bridge. For this purpose the four sides are made of the purest Norway iron, as soft as possible, and thoroughly annealed. To the acute angles of the rhomb are connected the poles of a long U-shaped electro-magnet, whose function is to develop the desired magnetic potential difference at these points. Connected to the two obtuse angles, and projecting inward, are two bars of Norway iron similar in section to those forming the sides. Their inner ends, which are hollowed out, approach to within about a half inch of each other. Between these ends a stirrup is suspended by means of a silk fiber, which stirrup carries a short needle consisting of a thin tube of hardened steel well magnetized. To the stirrup is attached either a pointer moving over a graduated arc or, better, a mirror by means of which the deflection can be read in the usual way with a lamp stand and scale.

In the instrument now in use in my laboratory, the magnetic bridge is in the form of a rectangle, the ends or poles of the electro-magnet being connected to the middle of the short sides, while the bars which pass inward to the needle are joined to the middle of the longer sides. The four halves of these longer sides constitute the sides of the bridge. The two at one end of the rectangle are fixed, the two at the other end are movable. The two bars which pass inward to the needle are curved so as to form a semicircle standing above the plane of the rectangle. The needle itself is similar in construction to that above described, but is suspended by a wire attached to a torsion head. A photograph of this apparatus I have the pleasure of exhibiting to the section.

It will be readily seen that when the electro-magnet is charged, a constant difference of magnetic potential is maintained at the two ends of the rectangle, so that if the four bars constituting the sides of the bridge are magnetically identical, there will be no difference of magnetic potential between the ends of the bars which pass to the needle, and hence there will be no deflection; but if one of the movable bars be loosened, the needle is at once deflected, and in a direction depending upon the side the bar occupies. If the bar be entirely removed, the deflection is a maximum of course. And if it be replaced by another bar differing in cross section, in quality of iron, or in any other way which affects the magnetic conductivity through the bridge, the deflection shows at once the amount of difference between that bar and the original one taken as a standard. The instrument is extraordinarily delicate, and the principal difficulties encountered in using it have arisen in the attempt to preserve this delicacy while at the same time the range of the apparatus is maintained.

The magnetic bridge was devised for the purpose of testing readily the quality of the iron purchased for the construction of dynamos. Very great variations are observed in irons supposed commercially to be of the same quality. Consequently, the potential difference developed by a dynamo having field cores of such iron can never be exactly calculated. But by comparing the iron which is to be thus used, in the magnetic bridge, its exact value for dynamo purposes may be determined, and the constants of the generator thus accurately calculated in advance.

But this bridge, it would seem, will be equally useful for testing iron and steel for other purposes. By its means, not only may the character and quality of the metal be ascertained in terms of any desired standard, but flaws in the interior of a bar, such as a car axle, may be discovered at once.

Constructed with sufficient care and attention to details, the magnetic bridge may without doubt be made a most valuable instrument of precision for the furtherance of scientific research. The theory of its action is extremely simple, and it is the exact counterpart of an ordinary Wheatstone bridge constructed for measuring low resistance and immersed in water, since, now, whatever is true electrically of the one is true magnetically of the other. Not only may the laws of magnetic conductivity be investigated by means of this balance for all para and dia magnetic bodies, but the variation of this conductivity under the action of various physical agencies, such as heat, pressure, strain, etc., may be determined. It is in the belief that this instrument may contribute something to the advancement of electrical science, and with the hope that it may do so, that I venture to bring it to the notice of my fellow members of the American Association.

* Abstract of paper read before the American Association for the Advancement of Science, New York, August, 1887.

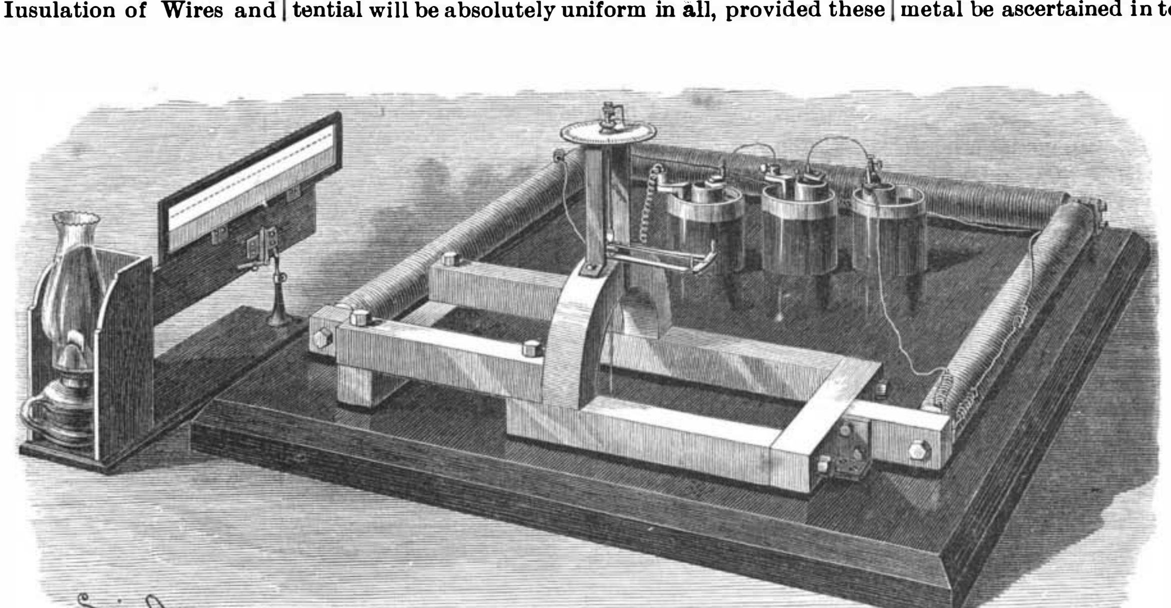


Fig. 1.—EDISON'S MAGNETIC BRIDGE.

THEY make a wine of tomatoes in Florida which is said to be superior to orange wine.