PLATT'S TRACING APPARATUS.

The tracing apparatus shown in the accompanying cut is thus described by Mr. S. L. Platt in the Philadelphia *Photographer*:

A great many photographers cannot afford a solar camera, and an apparatus that would enable them to have some of its advantages will doubtless be of service to them.

The first step is to procure the enlarged sketches of the picture you propose to make. This I do by means of the apparatus which I shall describe below.

As I have said, my invention is for tracing or sketching for crayon or other portraits. It can be used by any one, and for enlarging any object that can be attached to the top, which is to contain the picture, face down. It can be made of any size, from eight by ten to life-size. The lens, the movable front for focusing, clamps for holding the movable top, which is adjusted from inside, and governs the size of the object, and the reflector to throw strong sunlight on the object, will all be seen in the diagram; also the table or stand upon which the paper, or material upon which to draw the image as it is reflected down, is placed. This is a very useful instrument for any gallery, as any card can be enlarged to a perfect eight by ten, or larger, to show the customer how he would appear in a large portrait, which might induce him to have one made. The one I have is intended for a ten inch head, or from that down to eight by ten. It is two feet square at the base, four feet high, fifteen inches wide at the center, with a twelve inch arm to the reflector. The reflector has three movements, or six, counting the backward movements.

PLATT'S TRACING APPARATUS.

The movable box has only two movements, up and down, for governing the size of the reflection. The box is nine inches square, one inside of the other, fastened with a thumbscrew inside of the front curtain. The movable top is raised and lowered from the inside, and fastened by a clamp with a thumb screw in front. The thumb screw is ten inches long, to reach clear across the front. The strip across the center, holding the reflector, is eighteen inches long. The box or framework is covered with soft flannel, and lined with thick yellow paper, so no light gets in save the reflected light. It will be observed that the image is very strong, and has the appearance of a finished picture. The rays falling in at the top make it a very pleasant light to work in, just right for comfort, something like twilight. It takes one to trace by measure, as all portraits do on canvas or cardboard, from two to four hours.

An artist rarely crayons two heads alike from the same picture, and do his best. I can with this make eight sketches with ten inch head in less than an hour, and have them alike every time, for I will not change the focus, and pin the paper each time at the same place. Changing the position of the reflector does not change the reflection, as it leaves the picture every time alike. This is not usually the case with a solar printer. I am a great friend to the solar camera, but I can, by using a condenser, do the same work by this.

Silvering Mirrors.

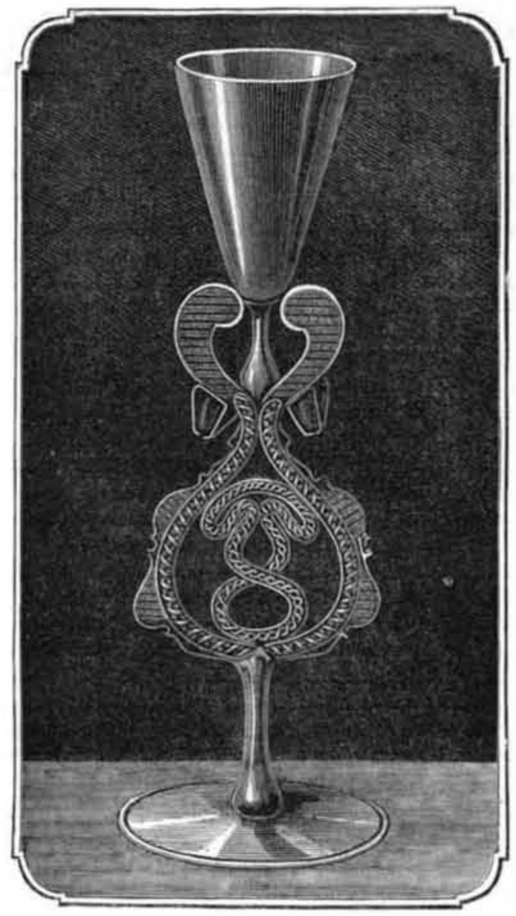
Some time since the Académie des Sciences offered a prize of 2,500f. for a method of satisfactorily and permanently silvering mirrors, and which should save the workmen the danger of exposure to the effect of mercurial vapors. The prize has been awarded to M. Lenoir, whose process is substantially as follows: The glass is first silvered by means of tartaric acid and ammoniacal nitrate of silver, and then exposed to the action of a weak solution of double cyanide of mercury and potassium. When the mercurial solution has spread uniformly over the surface, fine zinc dust is powdered over it, which promptly reduces the quicksilver and permits it to form a white and brilliant silver amalgam, adhering strongly to the glass, and which is affirmed to be free from the yellowish tint of ordinary silvered glass, and not easily affected by sulphurous emanations.

Sugar from Sorghum.

Dr. Collyer, chemist of the Agricultural Department, is confident that one-tenth of the corn acreage of Illinois would suffice to raise all the sugar used in the United States, if devoted to sorghum of the variety best suited to the latitude; this allowing practical results to reach only 50 per cent of those obtained in his most favorable experiments. The cost of the raw sugar, he thinks, should not exceed three cents a pound. The early amber cane is the species best suited to Illinois. Commissioner Le Duc, who has just returned from a tour of inspection in the West, reports that the most promising results have already been obtained. He visited one manufactory in Illinois, where 43,000 pounds of sorghum sugar have been made this season, equal in every respect to the best product of the sugar cane; and this enterprise has been carried on under exceptional difficulties. He visited, or received reports from many other localities to which he had sent sorghum seeds, all speaking in the most favorable terms of the prospects.

ANCIENT GLASSWARE.

Ancient Venetian glassware was of rare beauty, excelling everything ever made previously by any nation. Domenico Anzolo introduced the art of cutting, grinding, and polishing glass. Venetian mirrors especially, although they cannot be compared with the productions of modern times, were highly valued, and for several centuries Venice had a monoply of them. Imitations of precious stones were made in large quantities, also beads and imitation mother-of-pearl. Necklaces and cameos of the saints were exported in large quantities to Palestine, where they were sold to the pilgrims as amulets for fabulous prices.



VENETIAN GLASSWARE.

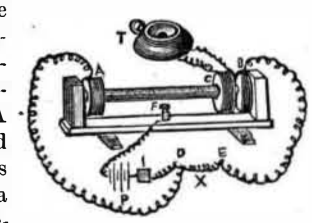
The most celebrated Venetian mirrors that have been preserved are those presented by the republic to the kings Henry III. and Francis I. of France. They are slightly convex, very thick, and set in frames of solid silver, gold, and damascened steel, about 30 inches high, 25 inches wide, and decorated with lilies and palm leaves formed of precious stones and gold. They were regarded as masterpieces of art at their time.

GERMAN GLASSWARE—16TH CENTURY.

Venetian glass was exported to all parts of the world, as far as known at that time. Enterprising merchants even established a regular trade with China, having been encouraged in this business by the celebrated traveler Marco Polo. In consequence, an immense wealth was accumulated, and the fortunes of common workmen in the glass houses were immense. Nevertheless many of them became tired of their golden cage, especially as many enticing offers were made to them by foreign princes. In spite of the rigid enforcement of the laws and the close surveillance under which they were placed, many of them escaped and were gladly welcomed and protected by the governments of the other European nations. Thus we find many Venetian glass makers in Germany toward the end of the 15th century, and from them the Germans learned a great many secrets in regard to the ornamentation and coloring of glass. German glassware, however, kept for a long time an eminently national character. The ornamentation consisted of banners, coats of arms, patriotic devices, and representations of important historical events, engraved with great skill. The principal seat of German glass industry was, and is yet, in Bohemia. In the 17th century the taste changed somewhat, and enameled cut glass came into fashion. Bohemian glass was very clear and colorless, and found a ready market.

MEASURING RESISTANCES.

M. Hospitaliar describes in the *Electrician* a method of measuring resistances, in which he uses a modified form of Hughes' audiometer. Two similar coils, A and B, are connected in a devised circuit with the battery the current of which passes through a vibrating contact. A coil of fine wire, C, is placed between the coils, A and B, and connected to the telephone. This coil slides along a graduated bar, so that its exact position may be easily determined. If, on introducing an inappreciable resistance between the binding screws, D and E, the current in A has the same intensity as in B, the actions of A and B upon C are equal and contrary, so that no sound is heard in the telephone. If a resistance be introduced between A and D, say one ohm, then the actions of A and B upon C are no longer equal, and a sound is heard in the telephone. The movable coil, B, is now adjusted till no sound is heard, and on the graduated scale a mark, 1, is made, indicating that the resistance between D and E is one ohm. Other known resistances are successively introduced and the scale completed, and then the unknown resistance inserted may at once be obtained by reading the scale at the point where sound in the telephone ceases. It is necessary that the battery used should be powerful enough to enable the feeblest sound in the telephone to be heard. The author of this method believes that it will be of great service for measuring the resistances of conductors, of electro-magnets, and telephone coils, because of its extreme simplicity.



The Largest Organ in the World.

The organ for the cathedral at Garden City, Long Island, now under construction by Mr. Hilborne L. Roosevelt, is described by the *Evening Post* as the largest and in several respects one of the most remarkable in the world. It will cost about $40,000, and will be put in place next spring. The main body of the instrument will stand in the chancel, and the organist will sit there. At the west end of the building, in a tower directly behind a large stained glass window, is a room in which a part of the organ will be placed and connected with the chancel by electricity, like the organ built by Mr. Roosevelt in Grace Church, New York. The window will be opened and closed by electricity, controlled by the organist from the chancel, thereby making fine crescendo and diminuendo effects with the organ in the tower. Over the ceiling, about the center of the building, will be placed another part of the instrument called the echo organ, which is to be played from the chancel by electricity. Underneath the chancel, in the chapel situated there, is a part of the organ, which is arranged so that it can be played in the chapel as well as from the chancel. Lastly, the large chimes which hang in the tower will be connected with the chancel by electricity, so that the organist can play them from the keys of the organ. The bellows will be operated by hydraulic engines, and the organist can, by simply turning on the water, have the whole instrument, including the chimes, at his command. Though this will be a mammoth instrument, and notwithstanding the great distance between many of its parts, the pressure necessary to play on the keys will be no greater than is used in playing upon a piano. This is due to the use of electricity, pneumatics, and hydraulics, which combined render it possible and practicable to construct such an instrument.

There will be four vox humanas (similar in construction to the celebrated one in Freiburg); one of these will be in the chancel, one in the tower, another over the ceiling, and a fourth one in the chapel beneath the chancel. All of these will be under the control of the organist in the chancel, and will be capable of crescendo and diminuendo effects. Certainly some beautiful and extraordinary combinations can be produced with their aid. In all there will be one hundred or one hundred and twenty speaking stops, the exact number not yet having been determined upon. The Boston Music Hall organ has eighty-four stops, the Cincinnati organ ninety six, and the largest organ in the world, that in Albert Hall, London, one hundred and eleven. Five hydraulic engines will be needed. Quite a small Gramme magneto machine will furnish all the electricity needed. Where mechanical force is required, as in ringing bells or opening windows, compressed air will be used in an ingenious manner devised by Mr. Roosevelt.

How Sugar is Refined.

A detailed account of the processes by which the pure white granulated and cube sugars of our best refineries have been produced from the coarse sugars of the plantations, may be of interest, says the *American Manufacturer and Exporter*, to those not familiar with the methods now employed in Boston refineries, so favorably known by their products wherever shipped, and so remunerative to their owners.

The melting process, which is the first in order for refining sugar, is carried on in a melting room, so called, now mostly separate from the main establishment, in a building by itself, on account of the uncleanliness of the process. Here the hogsheads and other packages are broken open and emptied by machinery into a melting pan, together with the sugary water obtained by cleansing the empty hogsheads by steam. This melting pan contains from four to six hogsheads of sugar, and has connected with it a revolving horizontal or vertical shaft with stirrer knives for breaking up the lumps of sugar. Here, with water and steam, the sugar, which varies in quality, is melted to a consistency of about 30° Baumé, and drawn off through a sieve till all coarse impurities, such as nails, chips, etc., are removed. It is then raised by means of a large pump to the upper floor of the clarifying house, where it is received into the clarifiers or "blow ups."

The clarifying process is now entered upon, the clarifiers or "blow ups" being large shallow pans about ten feet in diameter and six feet high, having at the bottom a three or four inch copper coil through which the steam circulates. Here the liquor is gradually heated up to a temperature of about 180° to 210° Fahr., and to a density of 20° to 30° Baumé. All moist sugars contain more or less acidity, and on these lime is used. Dry sugars, especially Manilas and all lower grades of East India sugars, containing too much lime, are treated with sulphurous gas or an acid to neutralize the same. Alum is sometimes used to good advantage. In all cases the liquor, before it is filtered, should have an excess of lime in it to prevent it from fermenting. On the lower grades of sugar, bullocks' blood, either fresh or dried, is used. The albumen of the blood begins to coagulate at about 140° Fahr., forming a net throughout the liquid, which gradually rises, as the heat increases, to the surface, carrying with it all the lighter impurities, and leaving all the heavier ones at the bottom. Between the thick scum on the top of the liquid and the impurities at the bottom of the "blow up" a clear liquid will be seen, which is drawn off and finds its way to the bag filters, on the next floor below.

The filtering process now begins. The liquid from the clarifier or "blow up" passes through bag filters, which arrest all floating impurities in the liquid. These filters differ in size in different establishments, but where ten years ago about a hundred bags were put into a single filter, they now put from four to eight hundred. The filters are constructed as follows: At the top is a large tank for receiving the liquid from the clarifier above, the bottom of which is perforated with a multitude of holes, to which as many bags are attached beneath, to receive the liquid from the tank, and are double, that is to say, a bag made of cotton cloth, five feet long and about two feet wide, is introduced into a strong bag made of flax, six feet long and only six inches wide, and a brass bell-shaped thimble, larger end downward, is inserted into the neck of the inner bag, and both inner and outer bags are tied to it, both constituting one bag. These double bags are fastened to the bottom of the tank by means of a screw in the smaller end of the thimble of each. The tank holding all the bags on the bottom stands over another tank, which surrounds the bags and receives the liquor at its base as it percolates through the bags. This combination of filtering bags with upper and lower tanks constitutes the "bag filter," as it is named, and by means of it a large amount of filtering surface is obtained in a small space. The filtration is rapid, if the preceding clarifying process has been perfect.

From the bag filters the liquid runs into the receiving tanks on the floor below, and consists of the raw sugar in a liquid state freed of its coarse impurities, yet still retaining many objectionable ingredients which will prevent the crystallization of the sugar, and others which will impair the quality of the refined product. These impurities are gum, lime, salts, mineral substances, and coloring matter, which have to be removed by means of charcoal filters.

Charcoal has the power to abstract and retain the organic coloring matter and impurities of the liquor, and thus to assist the granulation of crystals, increase the amount of sugar, and improve its quality. Charcoal filters are now mostly built ten feet in diameter by twenty feet in height, each to hold about 90,000 pounds of charcoal (burnt bones). They are constructed with a perforated bottom, composed of separate pieces, so as to be removed and cleansed occasionally, and made to rest on wooden blocks so as to leave a space six inches in depth between the perforated or false bottom and the lower bottom of the filter. A filtering cloth or blanket is spread over the perforated bottom to prevent the filtered juice, in running through, from carrying any of the bone black of the charcoal with it. The filters now used have mostly closed tops and man holes on the side, at the bottom, and on the top, for the purpose of filling and emptying them when necessary. To secure a good filtration care must be taken to pack the charcoal uniformly throughout the filter, otherwise channels will be formed through which the liquor will find its way easily, overtaxing a part of the charcoal and leaving other portions unused. The object of these filters is to remove the vegetable coloring matter from the sugar liquor and any excess of lime which may have been supplied it during clarification, also all mineral salts originally existing in the cane or added to the liquor on its way from the clarifiers to the charcoal filters. It will be readily seen that this process is of the greatest importance to the sugar refiner, as almost all impurities, especially gummy substances, in the sugar liquor will hinder the granulation of the crystallizable sugar in the next process. The charcoal is therefore called the "soul of the sugar refinery," and the success of the business in reality depends on it alone. Some of our large refineries have from three to four million pounds of it in constant use. The charcoal which has been used to the extent of rendering it useless for further filtration, is made as good as new or better by a process known in refining parlance as revivification, and is made to do duty over and over again. In the year 1811, it was discovered that animal charcoal possessed the same power of retaining coloring substances, etc., and abstracting them from sirups, that vegetable charcoal or burnt bullocks' blood had. The charcoal filter was first introduced by Mr. Dumont, in the beet sugar factories of France. The liquor from the base of the charcoal filters forces its way by natural pressure through connecting pipes downward and upward into receiving tanks above, and is drawn from thence through other connecting pipes into vacuum pans still higher up. The liquor is now ready for the

Concentrating and crystallizing process, or what the refiners designate as the "boiling process," which requires large experience, skill, and ability to conduct properly. The vacuum pans are most of them made of cast iron, and two of the largest ones ever built reach the enormous dimensions of eighteen feet diameter. Smaller ones, seven feet in diameter, are often made of copper. Large pans yield larger crystals and a larger amount of sugar, and proportionally less sirup, than smaller ones, and are best adapted to a centrifugal house. Small pans are mostly used in mould houses.

In the commencement of the "boiling process" the liquor should be run in as quickly as possible into the vacuum pans till the whole heating surface is covered, then the steam turned on, and the evaporation conducted at a temperature of from 140° to 150° Fahr.; as soon as the liquor begins to granulate or form crystals the temperature is reduced to 125° Fahr., and finally, just before the evaporation is completed and the sugar is ready to be let down into the heater, it is further reduced to 110° Fahr. When the sugar boiler ascertains, by withdrawing a sample of the liquor with the proof stick, and drawing it out against the light between his finger and thumb, that the crystals are in a sufficiently forward state for his purpose, he adds some more of the thin liquor to that already in the pan and continues the boiling operation as before. When this last charge is brought into the same state as the former one, he adds another quantity of the thin liquor, and so repeats the process till the vacuum pan is full. At each successive charge the crystals continue increasing in size to the end of the operation, those first formed serving as *nuclei* for those that follow. If a fine grained sugar is required, the boiling must be done under a higher temperature, and the proofs must be taken thicker. If a coarser grain be sought for, the temperature must be lower and the proofs thinner.

The concentrated juice is now let down through a cock or valve in the bottom of the pan into the "heater," which is a large tank made of cast or wrought iron having a revolving shaft in its center, with knives attached to keep the body of sugar in agitation and prevent its becoming a solid mass. The cooler this liquid can now be kept the better, in order to give the largest possible yield of sugar and the least proportional amount of sirup, except that heat must be applied if it should become too cold and thick to run through the apertures in the bottom of the tank into the centrifugus.

Instruments of Precision.

The ingenuity of medical men has been displaying an unwonted activity of late, and new methods and appliances for the examination of the human body are being continually announced. Instruments of precision just now are in the ascendant; and the *Medical Record* is correct in saying that never before have anatomical structures or physiological functions been put under such close and exact scrutiny.

The writer proceeds to give a summary of those discoveries most recently introduced by the medical profession. We learn that electrical lights are penetrating the viscera, and that the pathological changes in the blood corpuscles are being very exactly noted and classified. The news of these things has already reached the laity. It is announced in a leading New York daily that a celebrated microscopist has allowed a gentleman to marry because his white blood corpuscles were—or were not—finely granular. In fact, there have been so many other interesting reports of this kind that we find it well to call attention to some of these devices with which humanity is becoming so closely environed.

We have spoken in a previous issue of the apparatus that has been invented by a French physiologist for measuring the amount of heat thrown off from the body in any given time. If we may believe the inventor, the temperature changes of our systems can now be put under the exactest supervision; a man can neither change his diet nor undergo a physical exertion without its being registered in British units. With the present delicate surface thermometers also only local changes in nutritive activity can be determined. Active cerebration, an overloaded stomach, or a deep-seated inflammation, all send up the index. To a lively imagination the practical application of these various forms of thermometry promises the most extraordinary results in the cerebral department. When it is established, as it is hoped it may be, that the value of a thought is to be measured by the amount of cerebral tissue consumed and heat evolved, every man's intellectual caliber can be definitely established in degrees Fahrenheit; the problems of life will then be greatly simplified.

There has always been much ingenuity shown in investigating the normal and pathological conditions of the lungs, but never before have investigations presented such large, we may say sonorous, results. Mr. Edison, for instance, promises us a stethoscope, with which we hope nothing less than that the breeze from the epithelial ciliæ may be heard and differentiated, as also that the noise from the development of a tubercle may be brought with melancholy distinctness to the ear. These are but hopes and promises, however, which may partially fail us. We take pleasure, therefore, in recording the more modest, but better established inventions of a gentleman from New Jersey; inventions which deserve notice, indeed, if only for the melody of their nomenclature. There is, first, the respiratory anemometer. This instrument consists simply of a tube, a valve, a movable pen, some gearing, a few levers, a strip of paper, and clockwork. By breathing into the tube, a record is obtained of the character of the respiration, with the relative length of inspiration and expiration.

Supplementary to this valuable piece of mechanism are the pneumosiren and the unison resonator. The former gives, among other things, the character of the respiration, while the latter announces to the ear the smallest deposit of tubercle. With these three instruments, a stethoscope, a pleximeter, and a sounding towel, it will be strange, indeed, if phthisis cannot be arrested even in the third stage.

Dr. Richardson, of London, has utilized the microphone in such a way as to form what he calls an audiometer. By it the capacity of the ear to appreciate sounds can be accurately measured, and he has already made some interesting discoveries in regard to hearing. The application of the carbon telephone to urethral surgery is well known. Sir Henry Thompson, by attaching a form of this instrument to a Maillechort rod, finds that the presence in the bladder of the smallest particle of gravel even is readily appreciated. It only remains to extend its application to the pelvis of the kidney. Some time ago Dr. Nestler, of Germany, announced that he had invented an endoscope, with which he could see the interior of the bladder, and even of the stomach. At the recent meeting of the International Medical Congress, M. Trouvé, of Paris, stated that with his electrical polyscopes he could accomplish this same result, and an exhibition of his instruments was made. Thus the glory, as well as the necessity, of Alexis St. Martin is taken away.

We have referred to but a small part of recent mechanical achievements, but it is enough to show that the medical profession is progressing, and is, as usual, absorbing the other sciences into its own. The present inventive tendencies, of which, perhaps, we have spoken too lightly, show the impress which modern physics is making on medical science, and we would by no means undervalue its benefits when within the scope of practical utility.

How to Stop a Cold.

Horace Dobell, in his little work on "Coughs, Colds, and Consumption," gives the following plan for stopping a cold. If employed sufficiently early it is said to be almost infallible: 1. Give five grains of sesquicarb. of ammonia and five minims of liquor morphine in an ounce of almond emulsion every three hours. 2. At night give ʒ iss. of liq. ammon. acetatis in a tumbler of cold water, after the patient has got into bed and been covered with several extra blankets. Cold water should be drunk freely during the night should the patient be thirsty. 3. In the morning the extra blankets should be removed, so as to allow the skin to cool down before getting up. 4. Let him get up as usual and take his usual diet, but continue the ammonia and morphia mixture every four hours. 5. At bed time the second night give a compound colocynth pill. No more than twelve doses of the mixture from the first to the last need be taken as a rule; but should the catarrh seem disposed to come back after leaving off the medicine for a day, another six doses may be taken and another pill. During the treatment the patient should live a little better than usual, and on leaving it off should take an extra glass of wine for a day or two. —*London Medical Record.* [We think the remedy here suggested is rather worse than the disease.]

A BRILLIANT PURPLE FOR SHOW BOTTLES.—Sulphate of copper, 2 drachms; water, 2 ounces; French gelatine, 1 drachm; boiling water, 2 ounces; solution of potassa, 2 pints. Dissolve the copper salt in the water, and the gelatine in the boiling water. Mix the two solutions and add the liquor of potassa. Shake the mixture a few times during ten hours, after which decant and dilute with water.—*Can. Ph. Jour.*

PRICE OF RARE METALS.—Dr. Theodore Schuchardt, of Goerlitz, Germany, prepares some of the rarer metals, and charges for them the following prices: Cerium, 20 shillings per gramme; lanthanum, 40 shillings; didymium, 30 shillings. These are in globules obtained by electrolysis. Thorium, in powder, is 36 shillings per gramme.