SIMPLIFIED APPARATUS FOR PHOTOMICROGRAPHY.

Every one knows at present the importance of the discoveries due to the use of the microscope, and upon this point it is absolutely useless to dwell. It appears to us preferable to recall that microscopic studies may find in photography a wonderful auxiliary, which permits of indelibly fixing the subject studied. Without dwelling more than is reasonable upon certain preparations that are apt to alter, as frequently happens with histological sections, photography will fulfill the role of an impartial and faithful observer, and give prints capable of being studied and discussed with fruit. In fact, they may be submitted to different observers, and be compared and verified. The same is evidently not the case when a discussion arises apropos of observations that have for obligatory intermediary the more or less faithful memory of the micrographer, or that are accompanied with drawings or sketches difficult to interpret. Unfortunately, photomicrography requires the use of complicated and costly apparatus. Without stopping at special apparatus, it will be necessary to own an excellent microscope, and combine the use of it with that of a camera constructed with a view to this particular application. And even in this combination, which is the simplest and most employed by all those who already own a microscope, we are yet at a standstill in certain hypotheses, because the microscope constructed for direct observation is not always adapted for photographic reproduction. Thus, with the ordinary microscope tubes, it is almost impossible to photograph wide preparations, such as the medullæ, which are so interesting to study in nervous pathology. As for the bulbs, they cannot be thought of. In such particular cases it will, therefore, be necessary to return to the models especially constructed for the use of photography. This rapid *exposé* of the difficulties that are met with in the practice of photomicrography easily explains why so few persons outside of scientific laboratories devote themselves to these researches, which are nevertheless so attractive.

Numbers of amateurs in photography would not be afraid to undertake such studies, new to them, if they could find a simple and inexpensive apparatus and utilize it with the material that they are accustomed to employ. It was such a thought that guided Mr. Lemardeley, a most distinguished young optician, in the construction of a small simplified photomicrographic apparatus that we are happy to make known to our colleagues, for in our opinion it completely solves the problem, and is bound to open up new horizons to such amateurs as are desirous of stepping ouside of beaten footpaths. We believe likewise that it will render service to many investigators who have not the means to spend large sums, and who with this apparatus will be able to pursue their special studies and obtain excellent results.

The apparatus is represented in Fig. 1. It consists of a piece, P, mounted upon pillars and provided with two clips, V V. At O is seen the objective provided with a micrometer movement, M. C is a condenser. At D is the diaphragm designed to limit the field of the image. The whole is fixed to a disk, R, analogous to that of photographic objectives, and which it suffices to mount upon the camera in order to be able to operate (Fig. 2).

Upon the whole, we find here all the parts of an ordinary microscope, less the illuminating mirror and the tube that carries the eye piece.

The suppression of the microscope tube is important, for that is what permits of obtaining the essentially practical arrangement of the Lemardeley apparatus, which is adaptable to any camera, like an ordinary objective. In this way are likewise avoided the reflections that occur in the tube of the objective, and that it was formerly difficult to eliminate. Finally, there is no longer anything to prevent the reproduction of preparations with wide surfaces, and which it is impossible to effect with the narrow tube usually employed. The apparatus is illuminated by the direct rays coming from any luminous source placed in front on a level with the condenser, and at a short distance from the latter.

Naturally, the more intense the light, the more the image will be illuminated and the easier it will be to effect the focusing, and the more, too, will the time of exposure be reduced. In the experiments made by us, we employed the oxyhydrogen light projected upon a pearl of magnesia. Under such conditions, the time of exposure never exceeded a few seconds. But one can operate practically with an Auer burner or a good kerosene lamp. The condenser calculated by Mr. Lemardeley consists of a system of lenses so colored as to render the light monochromatic and to thus allow of a good definition being obtained. This system can be removed, and we then have a diaphragm of very wide aperture permitting of the reproduction of preparations with wide surfaces. The pillar piece, P, is arranged in a peculiar way. It is very widely hollowed out and the clips designed to hold the preparation are below instead of being above, as in all microscopes. This simple change from a practical view point has a genuine importance, since it permits of putting the preparation in a plane that is always the same, whatever be the thickness of the object holder or object cover.

In fact, in putting in place the preparation with the object cover on the side toward the objective, the latter locates itself in the opening of the pillar piece, and it will be the upper surface of the object holder that will always come in contact with the lower part of the said piece.

The optical system likewise studied by the inventor consists of a series of lenses calculated for giving various magnifications. In the apparatus that we have had in hand, the relation of the magnifying power of the various combinations was: First combination, 5 diameters; second, 20 diameters; third, 50 diameters. We speak here, of course, only of the proper power of each combination, and not of the size of the image, which varies, according to the extension of the camera, between five and several hundred diameters. The system of mounting of the objective is interesting to note, for Mr. Lemardeley, in order to render his invention still more practical, has devised a system of automatic focusing, which, it must be admitted, will greatly facilitate the operations for all those who are not familiar with the use of the microscope.

The tube of the objective holder, X, slides in a tube, Z, actuated by the micrometer screw. This tube is provided with two indents, E E′, of different depths. Upon placing the pin, G, of the objective holder tube in one or the other of these indents, or in contact with the edge of the tube, Z, the objective is placed automatically at such a distance that the image shall be distinct upon the photographic plate with every magnification. By this arrangement, feeling one's way is avoided, and the micrometer screw will be employed only for finishing the focusing, if that be necessary—a maneuver that will be useless if the apparatus is well regulated, and for the same extension of the camera, of course. If a short focus be employed, the pin must be put into the deeper notch in order to approach the front side of the preparation. In cases where the other combinations of longer foci are employed, the pin must be put into the indent of less depth, and, finally, against the tube, Z, for feebler magnifications.

As will be seen from the above description, Mr. Lemardeley's apparatus is remarkable by reason of its simplicity of execution and operation, and we are convinced that these qualities will assure it a genuine success.—*La Nature.*

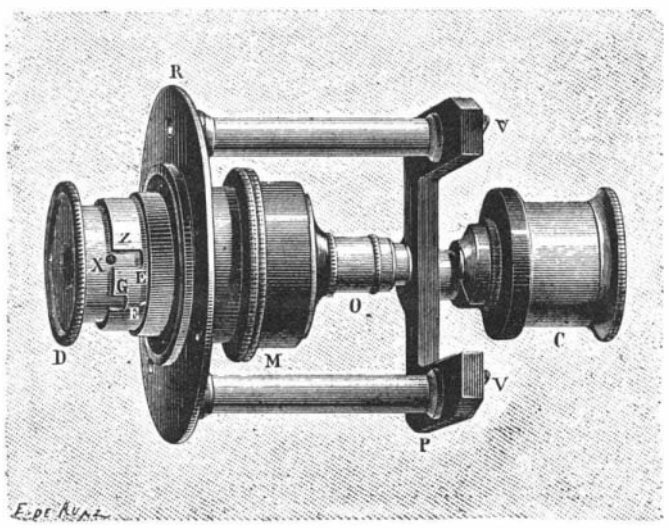

Fig. 1.—THE LEMARDELEY PHOTOGRAPHIC MICROSCOPE.

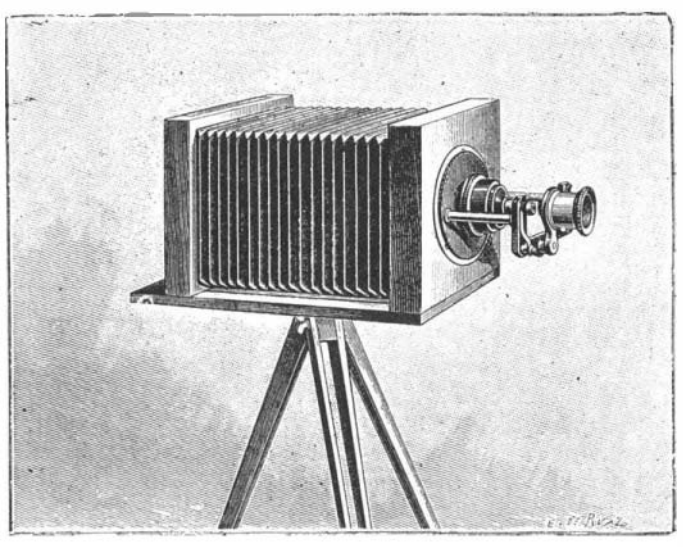

Fig. 2.—THE MICROSCOPE MOUNTED UPON A CAMERA.

THE *Engineering and Mining Journal* estimates the silver production of the United States last year at 60,000,000 ounces, as against 65,000,000 ounces in 1892.

Ophthalmic Surgery.

The Greeks held a knowledge of diseases of the eye to be an indispensable part of a medical education, and the accuracy of their descriptions in many cases attests the progress they made in this department. Not a few of the terms they employed are used to-day.

The ancient Egyptians also were celebrated for their skill in the treatment of the disorders of this organ. But this, like other branches of learning, sank into obscurity, and there remained till the eighteenth century, when its revival began with an operation for artificial pupil, giving sight to a boy blind from birth. This was soon followed by Daviel's operation for the cure of blindness due to cataract. This specialty now began to receive the attention of educated physicians, and in 1773 Barthe founded the Vienna school so celebrated at the present day. In 1804 the London Eye Infirmary was organized, and in 1822 the New York Eye Infirmary, soon followed by similar institutions in Boston and Philadelphia.

The opening of these hospitals gave a very considerable impetus to the study of diseases of the eye. But it was not until after the invention of the ophthalmoscope that great progress was made.

Many earnest workers now entered this field, in both the old world and the new, and the consequent advancement during the last fifty years has been unsurpassed in any other department of our art. Among these investigators were many whose achievements have laid the world under obligations of priceless worth; but I shall detain you to speak of only one—a name blazing with the splendor of a succession of triumphs more brilliant than those of field or forum. Von Graefe, who at the early age of forty-one fell a victim to unremitting toil in the service of this branch of our art, was justly regarded as one of the greatest minds in the profession. Among the many additions to our knowledge which we owe to him are two which alone would render his name immortal. Before his time thousands annually became blind from a disease often attended with agonizing pain and for which there was no cure known until he found it in the operation of iridectomy. In the method of cataract extraction for the cure of blindness due to this cause in vogue prior to his time, about twenty per cent of all eyes operated on were lost. This high percentage of bad results he so far reduced that in 1,000 cases operated on according to his method in the closing years of his life, his losses were less than three per cent, and this highly satisfactory result we now ordinarily obtain in our cataract operations.—*A. G. Sinclair, M.D.*

Nitrogen from the Air.

According to the *Evening Post*, of this city, machinery is now being set up in Newark, New Jersey, for manufacturing ammonia from atmospheric nitrogen. Every farmer knows that nitrogen is one of the essential elements of plant food and that it is far the most expensive of the elements that are required in fertilizing mixtures. It is well known, too, that nearly four-fifths of the great ocean of air that surrounds the earth is nitrogen, and that it is practically useless as food to plants, although they are bathed in it all the time. Recent researches have shown, it is true, that a small portion of this nitrogen can be utilized by certain plants, especially those belonging to the Leguminosæ, but there never has been any available method of transforming the nitrogen of the air into plant food for general use. Of course, it is not wise to expect too much from any reported discovery, but if it is true that the sulphate of ammonia can be produced by this new process at about one-quarter of its present cost, this will be one of the greatest boons that the science of chemistry has yet bestowed upon the art of agriculture. If ammonia can be cheaply manufactured from atmospheric nitrogen, the discovery means that a great step has been taken toward securing a material increase in the productiveness of the soil.

Experiments in the Prevention of Potato Disease.

Experiments in the prevention of potato disease were made at the Albert Farm, Glasnevin, and at Garryhill, County Carlow, in 1892.

According to the recently published report of the Agricultural Department, the Flounder, a variety extremely liable to disease, was selected, and the experiments were made with a view to ascertain whether the mycelium of the fungus reached the tubers through the tissues of the plant or by means of the spores falling upon the earth and then washed down to the surface of the tubers in the soil. The ground was covered early in June beneath the plants with cotton wool, carefully placed round the stems, with the object of filtering out the spores that might fall upon the ground. The disease appeared in July and the leaves of the plants were badly affected. When the potatoes were lifted in October it was found that there were no diseased tubers beneath the cotton wool, but a considerable amount of disease in the unprotected ground. Hence, it is provisionally inferred by those in charge of the experiments that disease spores reach the tubers by passing through the soil, but further experiments are necessary before stating definite conclusions. If this point be established, the advantage of high moulding, as advocated by Mr. Jensen, in providing a layer of earth of sufficient thickness to filter the rain water as it descends through the earth, and thereby arrest the spores before they could reach the tubers, will receive further proof. The potato crops in County Dublin are generally more free from disease than those grown in other parts of Ireland. This comparative immunity is attributed to the earlier planting of the crop, keeping the land free from weeds, and the general system of changing the seed from which the crop is grown year by year.

Cedar for Pencils.

Ask the next wise man you meet how many lead pencils are consumed per capita by the inhabitants of the United States and see if his wisdom will stand by him. If he answers correctly, says the *Northwestern Lumberman*, he will say something less than four for every man, woman and child.

The wood of which these pencils are made comes from Florida. It is red cedar, straight grained and comparatively free from knots. One of the manufacturing concerns has a mill in Florida where cedar logs are transformed into strips about seven inches long, three-eighths of an inch thick and three inches wide. These strips are crated and sent North. Each strip represents a half of six pencils. Six grooves are made lengthwise; into these grooves the graphite is placed and two strips are glued together. The block is then split into squares and the pencils finished either round or hexagon as desired.

May be you have never thought of it in that light, but the pencil industry uses up a large amount of cedar. An average red cedar log contains about four cubic feet of wood, and there are on an average 25 trees to the acre. If no mistake has been made in the rapid computation, it requires the timber from not less than 2,600 acres to supply the pencil manufacturers of this country. In addition considerable cedar is exported to Germany. Alabama was once the great pencil cedar producing State, but the cedar, which was clearer and larger than that found in Florida, is exhausted. Manufacturers have tested other kinds of wood with a view to finding a substitute for cedar, but so far without success.

It doesn't take long to make one pencil. The graphite is ground and mixed with great care, and in this mixing is the pencil maker's secret. The mixture is placed in a machine that might properly be called a little sausage stuffer, from the end of which is forced a constant stream of lead the proper size for a pencil. These threads of lead are cut in lengths, baked in an oven, and when hard are glued into the little grooves. The rough pencils are shaped either round or hexagon at the rate of 75 a minute, or 45,000 a day; 125 pencils a minute, or 75,000 a day, are colored and varnished; burnishing and stamping are done at the rate of 100 a minute, or 60,000 a day. This work is done by machinery operated by girls not more than 12 years of age, and who, no doubt, earn as much as a dollar or two a week.

The little blocks which are frequently used inside of the bunches of pencils are made of poplar, each block being grooved to fit the pencils. Twenty years ago you paid more for a pencil than you do to-day. The invention of machinery and the discovery of a graphite mine have reduced the cost of them at least 50 per cent. Foreign pencils have been gradually ousted, and at present, if I am not mistaken, we export about as many lead pencils as we import.

The few factories in this country hang together like brothers, and the chances are that if we should put our spare money into a lead pencil factory, they would make it warm for us. Whether you think a pencil is a good one or not, depends. If the profits on lumber are rolling in and you are making money hand over fist, you would be satisfied to figure with a burnt stick, but when it is uphill business to make the two ends meet, it takes an A 1 pencil to call out favorable comment.

Creameries and Typhoid Fever.

Another very important case has occurred in Ireland, in which it is alleged that the poison of typhoid fever has been distributed through the agency of a creamery. It seems that there is at present a serious outbreak of enteric fever in and around Castleisland, and that a local creamery had received milk from farms on which the disease existed, had separated the cream and then distributed the "skim" in proper proportion among the different farms. No proof was offered that this was the cause of the epidemic; the charge brought against the creamery being that, "being purveyors of milk or occupiers of a milk store," they had allowed the milk to be handled by a person in contact with one suffering from a dangerous infectious disorder. A penalty of £5 was imposed. The recent enormous extension of the creamery business, involving as it does the mixing of the milk from whole districts, evidently brings with it many dangers.

Formerly milk typhoid was characterized by sudden outbreaks widely spread among the customers of infected farms; but under the creamery system, by which each farmer receives back his proper proportion of skim from the general stock, enteric fever on any one farm tends to be rapidly distributed throughout the dairies served by the creamery, and it becomes quite obvious that, if the creamery system is to be safely worked, a very careful and thorough system of inspection of the farms must go along with it.—*British Medical Journal.*

Unknown Dead in a Great City.

Albert H. White, keeper of the morgue in this city, testified in a murder trial the other day that 140,000 bodies have passed through his hands since he has been the keeper. He added that he knew many cases where mistakes had been made as to the identity of dead bodies, and cited the case of a woman who claimed a body as that of her husband and had the body buried in Calvary Cemetery.

RECENTLY PATENTED INVENTIONS.

Railway Appliances.

AUTOMATIC GRAVITY CAR COUPLER.—A. R. Heath, Covington, Ind. According to this invention a pendant pointed hook on the drawbar through a slotted hole in the front end of the draught timbers and front ends of clevis, hooks to the bar in the opposing car, there being lift handles at either side of the car, or handles having a link connection at the top of the car. The drawbar is attached to rear springs in all cars. An old style link may be employed to couple with other couplers. There is a spring buffer in the deadwood and sill above, so that the hook pin or drawbar never buff, and the draught timbers and irons never buff out, and there is no occasion for trainmen to go between the cars. The engineer in his cab may operate the device to uncouple cars from the train. The coupling is simple, durable, and inexpensive.

RAILROAD FROG.—David Horrie, Kaukauna, Wis. This is an improvement in which the rails are utilized to produce the frog, in a combination of supported converged track rails and swinging rails bent near one end to approach each other, their shorter portions aligning with the track rails, between which and the adjacent ends of the swinging rails is secured a wedge-shaped filling block, having diverged limbs lying along the inner sides of the swinging rails, there being an intermediate frog point with apex introduced between the parts of the swinging rails. The construction is simple and durable, and adapted for the traverse of rolling stock in either direction of travel, facilitating also the safe crossing of one track over another track.

Electrical.

STORAGE BATTERY PLATE.—Chaimsonovitz P. Elieson, London, Eng. This invention relates to plates or non-tubular electrodes of the Plante type, and the battery plate is built up of parallel layers of corrugated and perforated metal, the corrugations of one metal being at an angle to those of the adjacent layer, so as to prevent nesting or coinciding, and preserve an even and constant groove space between and a fixed and permanent bracing of the layers in relation to each other, the plates so built up having their corrugations parallel to the plane of the plate, and having also detached vertical terminal edges. The buckling and consequent rapid disintegration of the plates is thus prevented, and uniformity of internal construction and resistance is insured.

Mechanical.

PLUMB RULE.—Frank Holt, South Pittsburg, Tenn. This is a rule having two graduated blades arranged at right angles, with their edges parallel to one another, and adapted to fit on and be secured to the corner of a wall. It is of simple construction, and more especially designed for the use of masons and bricklayers, enabling a workman to quickly and accurately lay the stones or bricks in proper position, according to the measurement indicated on the members of the rule.

TRACE CUTTING AND TRIMMING MACHINE.—Henry A. Dodge, Boston, and William T. Richards, Newton, Mass. This machine is adjustable to form traces of any desired width, and the knives are automatically operated upon the leather to simultaneously trim the side faces and round off the upper and lower corners, a trace of perfect construction being formed by simply passing the material through the machine. A wheel carrier automatically feeds the trace leather or strap to the knives, which are upon carriages at each side of the strap, and automatically adjust themselves to any desired thickness of strap.

STONE AND ORE CRUSHER.—Caleb G. Collins, Woodsburg, N. Y. This machine has revoluble rings in peripheral contact with each other, crushing rolls in interior frictional contact with the rings, and at points in alignment with the peripheral contact point of the rings, rocker arms carrying the shafts for the crushing rolls, and guide rolls carrying the rings. The machine is designed to reduce to a pulverized state stones, ores, and other hard and refractory substances, the machine being of large capacity, and operated at a minimum loss of power through friction.

Agricultural.

THRASHING MACHINE.—Alexander M. Lockhart, Mitchell, South Dakota. This machine is designed to be very effective in operation, and to completely separate the grain from the chaff. It has an elevator for raising the chaff into a conveyor, discharging into a fanning mill, which delivers the heavy chaff into a conveyor connected with a second elevator discharging into a return spout for carrying the chaff back to the thrasher cylinder.

Miscellaneous.

OVERHEAD CABLE TRACTION.—Walter G. Berg, New York City. This system is for propelling vehicles traveling on the ground or on tracks, but not for supporting their weight. It comprises an overhead fixed track on which travel wheeled hangers connected with an endless traveling cable, which has a flexible connection with a vehicle traveling on the ground or on a track, one part of the connection being secured to the vehicle and the other to the cable, the two parts being detachably connected. The improvement is principally designed for propelling cars and other vehicles in warehouses, mines, on wharves, etc., for transporting persons or merchandise.

ADJUSTABLE ODOMETER.—Theodor Schroeder, New Prague, Minn. This is an instrument to be attached to carriages, for the use of livery keepers, and for surveyors and civil engineers, to indicate the number of miles traveled. It is designed for application to the wheels of all vehicles, irrespective of their size, and still afford an exact measurement record, being adjustable to the size of the wheel, computing its circumference in feet and fractions thereof, and at each revolution transferring such measurement to different gears to be recorded in a cumulative way upon the register of the odometer in miles.

HEATER.—Joseph H. Adams, New York City. To properly heat and ventilate rooms, halls, shops, cellars, etc., where ordinary sources of heat are not practical or convenient, is the design of this invention, which comprises an exterior shell with air inlets at its lower end and outlets at the upper end, a central smoke pipe connecting with the source of heat having near its middle a damper or valve, while a series of smoke flues arranged in the shell are connected at their lower and upper ends with the smoke pipe to cause the heat and smoke to circulate through the flues, to heat the air circulating in the shell around the flues.

RACKING BEER.—August Werner, Brooklyn, N. Y. For the filling of beer, ale, and like liquids, from casks into kegs or other vessels, this inventor has devised a method and apparatus according to which the liquid is discharged from the storage cask to an elevated receiver, subjecting the receiver to gas pressure, passing gas into the vessel to be filled and discharging air therefrom, and then passing in the liquor charged with gas. The receiver is adapted to be raised and lowered, the beer preferably being filtered before being passed into it, and the pipe of the filling device having a liquid controlling valve, while a gas valve is connected with the gas supply for regulating the egress of the air from the keg and holding the gas in the keg while filling it with the liquid.

LUBRICATOR.—William A. Seibel, Independence, Iowa. According to this invention the machinery to be lubricated has movable projections and a bracket carrying a pulley, while the oil can has a spring-pressed slide valve and an arm engaging the projections, a lifting rope from the can passing over the pulley, and a guide rope depending from the side of the can. The improvement is more especially designed to facilitate the lubricating of elevated machinery, such as windmills, the operation being effected from the ground and obviating the dangers incident to climbing the framework or towers.

METAL FENCE.—George D. Hamilton, Innisfail, Canada. This fence has tapered, tubular metallic posts, with keyhole slots, and hollow metallic rails with concave ends whose side portions or ears are perforated, the fastening bolts being inserted through the posts in the slots, while flanged pickets are bolted to flanges on the rails. The fence is cheap, substantial, easily constructed, and may be made very ornamental.

TRUNK.—Benjamin Dickenson, New York City. This invention relates particularly to trunks having removable drawers, and provides a construction which facilitates the taking out of the drawers, but with an automatic fastening device arranged inside, so that it cannot be tampered with and is not exposed in any way to be broken, but which is automatically operated by the opening and closing of the trunk lid, the closing of the lid locking the drawers and the opening of the lid releasing them.

COMPOSITE BOTTLE.—Alphons Dryfoos, New York City. In the sides of this bottle are vertical niches or recesses in which are set small bottles of special construction, for holding a variety of liquids, the arrangement being such as to permit of pouring the liquid either singly from any of the individual bottles, or from two or more at the same time, for making a mixed drink.

FAN.—Max Rubin, New York City. This is a folding or pocket fan in which retaining arms are secured to the folding body and adapted to fold with it, receiving arms being connected with one another and with the retaining arms. The fan presents a very neat appearance, is readily opened for use, and occupies but little space when folded.

MIXER OR BEATER.—Arobine C. Mitchell, Ennis, Montana. This device is more especially designed for use on the materials or batter of which cake, etc., are made, the invention being an improvement on a former patented invention of the same inventor, and providing means for increasing or decreasing the speed, and whereby the basin may be more readily removed from the frame, also providing a bearing for the piston of the beater that it may be operated with least friction, the cost of manufacture being likewise reduced.

DESIGN FOR VASE SUPPORT.—Albert Wanner, Jr., Hoboken, N. J. This is an ornamental support for vases and other receptacles, in which continuous leaf-like effects in wreath form are shaped to project upwardly crisps and tendrils to join a ring-like margin at the top of the base.

NOTE.—Copies of any of the above patents will be furnished by Munn & Co., for 25 cents each. Please send name of the patentee, title of invention, and date of this paper.

NEW BOOKS AND PUBLICATIONS.

AMERICAN PLUMBING. A complete compendium of practical plumbing, from solder making to high class open work. By Alfred Revill. New York: Excelsior Publishing House. Pp. 224. Price $2.

The present work is written from the standpoint of the city of New York, and furnishes an excellent example of the improved metropolitan practice. Especially to be commended is its reference to the laws of the Health Department of the city of New York. This is something which will make it of use to other communities as a model of practice.

ESSAYS IN HISTORICAL CHEMISTRY. By T. E. Thorpe. London and New York: Macmillan & Co. 1894. Pp. 381. Price $2.25. No index.

So much has been written about theoretical chemistry, and experiments in it, that the appearance of a systematic work on its history from the days of Boyle to the era of Mendeleef, the latter representing the most advanced views of the present time, is particularly to be welcomed. Professor Thorpe's high qualifications for this work need no comment from us. The book absolutely fills what has been a decided want, and it should form part of every true chemical library. We cannot let it pass without paying due tribute to its excellence, but the work would be of many times greater value if it had been provided