increase in strength of the glass, its capability of withstanding greater mechanical stress and more violent blows, is undoubtedly valuable, but it seems likely that the expectations at first entertained as to the usefulness of the new product will turn out to have been exaggerated. Its unmanageable character as to any modification of dimensions, shape, or surface, by cutting with a diamond or by grinding, its complete, even dangerous, shattering when it does break, and the difficulty of securing uniform results from the tempering under varying conditions of size and shape of the articles treated, are all serious disadvantages, though perhaps not altogether incapable of being overcome by further modifications of the process. The very recent and rather startling proposal of F. Siemens to make railway sleepers of toughened glass, aside from any special difficulties or dangers, does not seem likely to be altogether free from the same objections arising from excessive jarring vibration and consequent wear and tear of rails and rolling stock, which caused the granite blocks used in the early days of railway construction to be laid aside.

Optical Glass.—The progressive improvement in this difficult branch of the manufacture, continued for a good many years past and still going on, is best evidenced by the steady increase in the size of the disks, now obtainable up to more than thirty inches in diameter, from which the largest telescope lenses are made, while clearness, uniformity, and freedom from flaws of any kind of these great lenses have also been secured in higher degree than formerly. Chemically the chief novelty in the composition of this kind of glass has been the introduction of thallium silicate into flint of unusual density, but this has been practiced upon a very limited scale only.

Decoration of Glass Work.—There has been of late years some advance in the clearness and brilliancy of colored glass for windows, but more marked results have been attained in the artistic than the technical treatment of this material. The revived imitation of the defects of ancient colored glass, such as embedded sand grains, air bubbles, and the like, form a curious feature of its recent history.

The imitations in glass of the various precious stones are made of late with remarkable fidelity to natural appearance, and some of the specimens sold are noticeable for a degree of hardness, much less, it is true, than is usually claimed for them by dealers, but much exceeding anything that was known some years ago.

Well deserving the attention they have received have been the beautiful products of the revived glass industry at Murano, especially the delicate "ritorto" work, depending on the plastic union of symmetrically disposed rods of variously colored glass and the twisting of the mass they produce as it is afterwards developed into the desired form. Not only under Salviati at Murano, but more recently in Austria has this mode of decoration been admirably applied to the reproductions of early forms as well as to designs of modern origin.

To the older varieties of "milk glass" or enamel has been added the "hot-cast porcelain" made by fusing together quartz sand, cryolite and zinc oxide, chiefly used so far for the rougher and less artistic articles which admit of being made from such material.

In surface enameling of sheet glass may be noted the transfer of lace patterns from the woven or netted fabric itself, used as a stencil to distribute the pulverized enamel upon the surface, afterwards to be burnt on.

The most valuable novelty in the surface alteration of glass is the process of etching by means of Tilghman's sand-blast. The simplicity and quickness of the process, the great depth to which the abrasion of the glass may readily be carried, cutting through, for instance, a flashing of colored glass or even producing complete perforation, the applicability of the method to sheets of glass so large as to be treated with great difficulty, if at all, by the older grinding-wheel or by hydrofluoric acid, and the delicacy with which the minute features of intricate designs may be engraved—admirably shown in some of the etchings of photographs upon a film of chromated gelatine covering the glass—approve the process as one of great and permanent value.

Amongst the latest modifications of glass decoration is the "iridescent glass" exhibiting a delicate play of soap-bubble colors, the result of slight chemical attack of the surface by moderately strong liquid hydrochloric acid under pressure in close vessels, or by the fumes from chloride of tin or analogous material volatilized in a reheating furnace.

The silvering of glass by deposition of metallic silver from its solutions by means of such reducing agents as glucose, milk sugar, aldehyde, tartaric acid, etc., has completely passed from the laboratory to the workshop, where it is now regularly and extensively practiced. A somewhat recent improvement consists in increasing the density of the film of silver, and at the same time removing the unpleasant yellow tinge which it is apt to have, by moistening the surface with a dilute solution of mercurio-cyanide of potassium, so as to form a silver amalgam.

Dodé's process for platinizing glass, by carefully heating it after the surface has received a nicely applied thin coating of platinic chloride mixed with one of the essential oils, has the advantage of furnishing a mirror which reflects from the front face, avoiding the double passage of light through the glass itself, while the exposed metal is not liable to tarnish. It does not seem to have been generally noticed that a simple piece of flat sheet glass treated in this way, and supported at a suitable inclination, makes quite an effective *camera lucida*, as the platinum film is thin enough to permit of the pencil and hand of the draughtsman being seen through it, while at the same time the objects to be copied are seen by reflection.

Glass drawn out into extremely fine threads—the so-called "glass wool"—has of late, in the hands of a Viennese firm, been used for decorative purposes of a better sort than the long known toys turned out at the glassblower's lamp, and has also been produced in useful shape as a material for filtration.

MANUFACTURE OF PORCELAIN AND OTHER CLAY-WARE.

It is more difficult to point out marked changes in this industry than in that of glass in matters connected with chemistry: the materials used being mixtures of more complex character, and the extent and manner of their union in the baking varying with the mode in which the heat is applied, the chemistry of both processes and products is less advanced. More attention has been given to mechanical improvements in grinding, mixing, etc., to the methods of burning, and especially to artistic expression in design and decoration. Still progress has unquestionably been made in the former direction within the last few years.

General Character of Products.—On the whole, probably the greatest improvement has been in the higher grades of

stoneware and earthenware, rather than in porcelain itself. Almost the same care bestowed upon the production of the latter has of late been given to the treatment of the former, the selection of the materials, their subdivision, careful kneading together, moulding, drying, burning, and glazing. Special kinds of ware have attracted particular attention from time to time, partly from the intrinsic character of the mass, partly from the designs which it has been used to carry out, such as the revived Majolica and Persian ware of Minton and the Parian and other biscuit ware of Copeland and others. The excellent common stoneware now made, strong and capable of bearing much in the way of change of temperature and exposure to energetic chemical reagents, has done valuable service as material for many of the vessels used in manufacturing chemistry.

Mechanical Appliances.—The most valuable of these brought into use in comparatively recent times has probably been the strong and effective filter press, which has done so much good service in connection with general chemical manufactures, and which is now largely used in removing the surplus water from the clay after the process of mixing. Special features introduced in some of these presses tend to prevent as far as possible the inclosure of air bubbles, which would lead to flaws in the ware when burnt.

Kilns.—The regenerative gas furnace has begun to lend its valuable aid to this manufacture as well as to that of glass, and with marked advantage, including much saving of fuel and reduction of the number of pieces of ware spoiled in the firing. In this application of the furnace there is room for careful study of the distribution of the heat, dependent on the arrangement of the gas and air flues, in order to secure uniformity of firing throughout the contents of the kiln, varying as these do in form and size.

Decoration.—The feature of most note in this direction has of late perhaps been the extension of the transfer of printed patterns and designs, replacing to a large extent painting by hand. The method in question has long been in use for coarser purposes, but now much better work is done, and the production of effects in several colors by the well-known method of superposition—"color printing"—is commonly and extensively practiced. Metallic "lustres" too are applied with more successful effect than formerly, and the peculiar surface appearance, resembling that of mother-of-pearl, given by a lustrous bismuth glaze, has been introduced.

A NEW METHOD OF TAKING THE SPECIFIC GRAVITY OF LIQUIDS.

By H. SOMMERKORN.

The apparatus required is a thin sided glass tube, divided into millimeters, and of from three to four centimeters in diameter, and a thin circular plate of exactly the same diameter, held by a string. The tube is closed with the plate, and the apparatus plunged into the liquid to be examined, pulling the plate against the tube with the thread. If the tube is plunged deep enough the hydrostatic pressure causes the plate to adhere. If the tube is then slowly raised upward in a vertical position, we reach a point where it merely hovers, and at the next it sinks. This point is easily observed. In the same moment the depth to which the tube is immersed in the liquid is read off on the scale.

If the specific gravity of the liquid = ρ , the superficies of the plate of glass or platinum = a , and its weight = G , and the depth to which the tube was immersed in the liquid = h . At the moment when the plate is about to sink its weight, G , must be equal to the weight of a column of liquid of the height, h , the area, a , and the specific gravity, ρ , or a, h, ρ , which pressure, being equal to the weight of the plate,—

$$\rho = \frac{G}{a \cdot h}$$

The factor $\frac{G}{a}$ is the same for all measurements, h only being a variable quantity.—*Chemical News*.

TO CLEAN GUN-BARRELS FROM LEAD.—Pour in a little mercury, agitate it over the interior surface of the barrel, and pour it out again. The mercury will amalgamate the lead and remove it.

ON THE REMOVAL OF PARTICLES OF STEEL OR IRON FROM THE VITREOUS CHAMBER BY MEANS OF MAGNETS.

By EMIL GRUENING, M.D., Surgeon New York Eye and Ear Infirmary, Ophthalmic Surgeon to the Mt. Sinai and German Hospitals.

The passage of a foreign body into the vitreous chamber is justly regarded as one of the most serious accidents to the eye. Encapsulation or tolerance of the foreign substance is of very rare occurrence, and, in the vast majority of cases, not only is the injured organ lost, but its fellow threatened by sympathetic ophthalmia. Generally speaking, the indications in cases of recent injury, complicated with the lodgment of foreign particles, are extraction of the body, and this failing, enucleation of the eyeball. Attempts at extraction by means of the instruments ordinarily employed (forceps, scoops, hooks, etc.) have so rarely been successful that some surgeons disregard the first indication and proceed at once to enucleate the injured eye. The most recent "Guide to Diseases of the Eye" (Nettleship) presents the status of the question as follows: "If it is certain that the foreign body has passed into the vitreous, whether through the lens or not, and whether by gunshot or not, it is scarcely ever worth while to attempt to save the eye."

McKeown, of Belfast, was the first to introduce a magnet into the vitreous for the purpose of extracting therefrom particles of steel or iron. (*British Medical Journal*, 1874.) Though he succeeded perfectly in removing the foreign body and in saving the eye, yet his recommendation of the magnet as an extractor did not procure for it a favorable reception. In a subsequent publication (*Dublin Journal of Medical Sciences*, 1876) he reports two additional cases, the one terminating in atrophy of the globe, the other in suppuration. Manz, who made an abstract of the first of these cases (Virchow und Hirsch, *Janresbericht*, 1875), remarked that although the object of the operation had been accomplished, the body extracted, and the eye but slightly injured, still the magnet employed could not be considered a trustworthy instrument.

The reason, then, why McKeown's method did not receive the favor which it merited will be found in the circumstance

that the particular magnetic instrument used by him was not suitable to the purpose. The magnet is described as being about eight inches long, one inch broad, one line thick, and tapering to a point at both extremities.

In 1879, Hirschberg (*Berliner Klinische Wochenschrift*, No. 46, 1879) successfully removed a piece of iron, 3 mm. long and 2 mm. broad, from the vitreous chamber, by means of an electro-magnet constructed for the purpose. The magnet consisted of a hollow cylinder of malleable iron, the two extremities of which were drawn out into long, fine points, like the branches of an iris forceps. The cylinder was surrounded by a coil which connected with a galvanic battery. Either of the poles of this electro-magnet easily sustained the weight of a small key, and attracted iron chips, 1 to 5 mm. long, at a distance of 1 to 4 mm.

Hirschberg's case excited much interest because it demonstrated clearly that a magnetic instrument, sufficiently delicate to be safely introduced into the eye, may still possess such powerful polarity as to extract particles of iron or steel from the vitreous without toil or trouble.

For some time past I have been experimenting with various forms of magnetic apparatus with a view of constructing an instrument that would concentrate the greatest possible magnetic polarity in the least possible dimensions. In my first trials I made use of well magnetized solid steel cylinders, one extremity of which had been filed into a long, slender, needle-like point. The latter, however, never exhibited sufficient magnetic polarity for the purpose in question, and, owing to the hard temper of the steel used in making good magnets, showed itself as brittle as glass, and broke upon the slightest provocation. Discarding the steel point, I had a long and delicate piece of malleable iron fitted into one extremity of the magnet. This slight alteration produced a more satisfactory instrument. Not only did the induced magnetism of the iron prove itself (*ceteris paribus*) more powerful than that of the steel point, but the fragility of the previously employed instrument had been removed also. In order to add still more to the magnetic polarity of the point, I joined several magnets into a bundle, thus making a powerful magnetic magazine. The principle of constructing such a magazine is old, the application of the apparatus for the removal of fragments of iron or steel from the vitreous chamber new. The two extremities of a number of magnetized steel rods placed parallel to and at a little distance from each other are fitted into iron caps, one of which is provided with a delicate point of malleable iron, 33 mm. long, 1 mm. wide, and 0.3 mm. thick. This point is powerfully magnetic, sustaining, with ease, a weight of 15 grammes. Chips of iron weighing from 1 to 50 centigrammes, when placed into the vitreous of recently enucleated animal eyes, are attracted toward the point at a distance of 1 to 5 mm., and withdrawn with the greatest facility. The instrument thus perfected equals Hirschberg's electro-magnet in efficiency, but surpasses it in simplicity of construction, convenience of form, and lowness of price.—*Medical Record*.

CATS FOR THE STUDY OF ANATOMY.

The *Journal of Microscopy* says that it was practical as well as philanthropic on the part of Dr. Burt G. Wilder to suggest the more extended use of the cat for dissecting purposes. The anatomy of the cat is very much like that of man; the resemblance being closer than that of most other domestic animals. The viscera have nearly the same arrangement; the brain has the primary divisions, and even some of the fissures, which are found in man. Most of the cranial nerves may be easily discovered. The bones and many of the muscles can be identified from a knowledge of Gray or Quain alone.

There are many drawbacks to the successful study of anatomy upon the human body. The expense is considerable, the subject may be bad, progress is always slow, and there is, as a rule, very little systematic study in connection with the work. Dissection and examination of the viscera are greatly neglected, and yet they are the most important parts for the majority of students. It is very likely, therefore, that preliminary dissections of an animal so easily obtained and cared for as the cat would be of great help to the student. While studying under a preceptor or while pursuing any course of preliminary training he could easily occupy part of his time in such anatomical investigations. He would thus acquire a practical familiarity with the use of the knives, the appearance of the organs and tissues, and the names and general arrangement of most of the structures of the human body. A splendid collection of microscopic slides might be prepared from the cats of any given locality, and not least of the benefits to be derived from the formation of such a collection would be the increase of peace and quietness in the neighborhood.

DENTISTRY IN THE UNITED STATES.

THAT people are becoming aroused upon the subject of decayed teeth can be seen from the employment of twelve thousand dentists in our country (United States) who, according to the best authority we have, are annually packing into the cavities of the teeth no less than about half a ton of pure gold, costing about half a million dollars. It is estimated that there are at present (1879) in the United States about one hundred and fifty millions of dollars in (gold) coin. Now at the rate at which gold is being consumed in filling teeth, it will only require three hundred years to bury the present amount of gold in this country into graveyards. Besides this, there is probably in weight four times as much cheaper material, such as silver, platinum, etc., used for filling cavities in teeth, which may be safely estimated at not less than one hundred thousand dollars, all of which in itself would amount to quite a large sum in the course of ten or twenty years (\$1,000,000 to \$2,000,000).

In the United States there are annually made about three million artificial or porcelain teeth, mounted on various kinds of plates, gold, platinum, rubber, etc., which help to keep the busy fingers of the dental profession at work. What is more wonderful, however, is that not half of the people need it avail themselves of their services.

From statistics taken in America, it has been ascertained that out of an average of about eighty people of all classes as we find them, only one can be found with perfect dental organs. All the rest are troubled more or less with decayed teeth. What an army of bandaged faces there must be pacing the floor in writhing torment every night, and yet some dentists wonder why the "Coltons" flourish while they do not; a query which it seems evident enough to me can be easily solved, and a change which is certain to be made when the profession shall take proper and liberal steps for a more general enlightenment of the masses of the people upon the subject of the importance of natural teeth.—J. N. Farrar, in *Dental Office and Laboratory*.