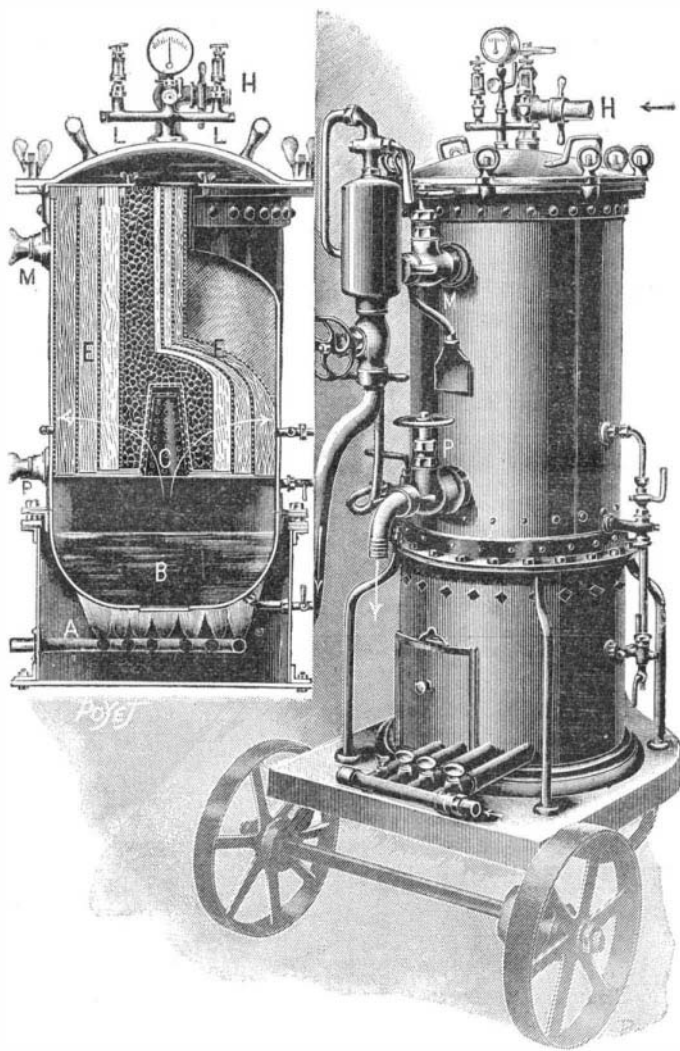


NEW STERILIZING FILTER.

THE filtering of liquids, when it is to be done industrially, is a delicate operation in which it is impossible to take too many precautions. The apparatus used for this operation are numerous, but their maintenance is costly, and it takes a long time to clean them, and it was in order to remedy such inconveniences that M. David Rojat was led to devise a style of filter that, in addition to its efficiency, offers great security by reason of the judicious arrangement of the filtering material, and that, at the same time, may be easily cleaned and sterilized. M. Rojat, by putting to profit the result of his experiments and observations, has arranged his apparatus in such a way that the filtration takes place rapidly, that is to say, in starting from the center of the filter and proceeding toward the periphery, and in traversing several thicknesses of a filtering mass of which the porosity continues to decrease.

The object of such an arrangement is to diminish to a large degree the velocity of the liquid to be filtered—a condition necessary for a satisfactory operation, since the impurities are less easily carried along than if a strong pressure were employed to make the liquid flow with great velocity. It may be remarked, too, that since the porosity diminishes in proceeding toward the periphery, the filtering surface will consequently be increased in measure as it becomes less easily traversed, and this tends to give a more uniform discharge, if we take into consideration the fact that upon reaching these less porous surfaces the liquid is already partially freed from its impurities.

The material adopted as a filter is cellulose, the absorbent properties of which are well known, and which is imputrescible and easily lends itself to combinations with other bodies, such as asbestos, which is capable of reducing its porosity.



THE ROJAT STERILIZING FILTER.

The medium of sterilization is the heat produced by a current of steam at 120 deg. C. Since such steam can be produced easily and at any moment, without the inconvenience of dismantling, there need be no hesitation about sterilizing the filter as often as may be deemed necessary, say several times a day, or even several times an hour, in the course of an operation. This is one of the most interesting peculiarities of the Rojat apparatus, which consists of an upright boiler divided into two parts by a false bottom, C, beneath which is situated the boiler properly so called, B, into which water is put. This latter is heated at the proper moment by a gas, kerosene, or alcohol lamp, A, in order to produce the steam necessary for the sterilization of the filter, E, situated immediately above.

A pressure gage, placed between two safety valves, permits of reaching, but not exceeding, the pressure of 2 kilogrammes necessary for obtaining 120 deg. C.

The center of the false bottom carries a double bell provided with apertures arranged in a contrary direction so that it may be traversed by the steam, but not by the filtering materials placed above. These are inclosed in cylindrical baskets, E, of perforated iron plate.

The upper part of these baskets is completely closed by a circular plate, open in the center and forming a hermetical joint with the cover, L, of the boiler. The tightness is assured by nuts that compress a rubber joint.

The liquid to be filtered enters through the conduit at H, and, flowing into the central space, soon fills it. Since it cannot pass through the cone C into the lower part, which affords no escape for the air, it traverses radially the different layers of porous material, which are more and more compact in the portions nearest the

periphery. Between the last layer and the walls of the boiler a space is left in order to permit of the flow of the filtered liquid, which escapes through M.

When it is desired to proceed to the sterilization of the filtering materials, the entrance of the liquid is arrested, and access is given to the air through the cock situated near the pressure gage. Then the liquid contained in the filter is made to flow through the cock P placed above the false bottom. The lamp is then lighted, and after the steam, which has become distributed throughout the entire filter, has passed through the open cocks, the latter are closed and the pressure raised until the desired temperature is obtained. After a quarter of an hour the entire mass may be considered as completely sterilized and the work of filtration may be resumed.—Translated from La Nature for the SCIENTIFIC AMERICAN SUPPLEMENT.

A SMOKE-WASHING APPARATUS.

We have had an opportunity of witnessing a trial of a smoke-washing apparatus which has been placed on the roof of Romano's restaurant in the Strand, London. A similar apparatus is being fixed in the basement of the Imperial Restaurant in Regent Street, but owing to building operations its application has been temporarily suspended at that place. This is to be regretted, as it is stated that the apparatus does its best work when attached to the lower portion of a chimney, as the fan contained in the apparatus so regulates the draft that chimneys are not required. The inventor is Prof. Giovanni Mugna, of Forli, Italy, who claims for his patent that it deprives the smoke of all those qualities which are objectionable, whether from the point of view of health or of cleanliness. It consists of a metal cylinder at the top of which are openings for the ingress and egress of smoke. A vertical shaft runs through the center of this cylinder,

Denmark Street, Charing Cross Road, London, W. C. We have said enough to show that the apparatus is one that deserves careful trial. If it should prove that it is capable of doing a fair proportion of what is claimed for it by its inventor, it ought to effect an appreciable difference in the atmosphere of any towns where it may be used.—The Lancet.

MEZZOTINTS.*

By CYRIL DAVENPORT, F.S.A.

THERE are two distinct ways of engraving metal plates, so as to be able to make prints from them, the intaglio and the relief.

The intaglio forms of engraving comprise line engravings with the burin, dry point, and all forms of etching with acid.

The relief forms of engraving comprise such blocks as those cut for Pigouchet's "Books of Hours," in the fifteenth century, and those etched by William Blake for the cheap reproduction of his poems, in the eighteenth century. The first of these two kinds of engraving has been most used as far as metal is concerned, as wood is easier and cheaper to make for relief blocks.

To print from a metal plate, engraved in the intaglio manner, a strong pressure is required, but to print from a relief block only a slight pressure is required,

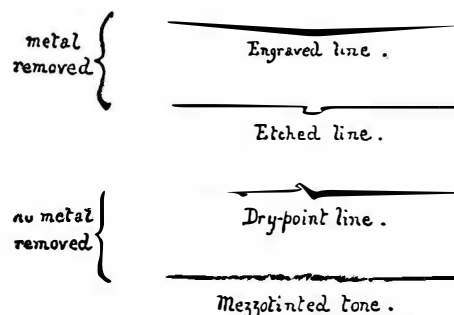


FIG. 1.—DIAGRAM SHOWING THE MICROSCOPIC FORMS OF LINES CUT ON METAL.

and in either case an impression can be made either in white or in black, according to the manner in which the intaglio or the relief block is inked and printed.

A mezzotinted metal plate is at first clearly an intaglio, but as the rocking proceeds and becomes closer, the resulting burrs are actually raised above the level of the normal surface, and to that extent the plate becomes a relief block. Like a relief block also it will print black, and as the surface is scraped away or burrished down, so also the resulting effect on the print is toward white.

The difference of the commoner lines made on a metal plate for the purpose of reproduction by printing shows clearly on one of my diagrams (Fig. 1). The upper line is a clear cut out of the surface of the metal, a thread of corresponding size to the cut being removed. The next line shows the effect of an etched line on metal; in this case the metal is first covered with a thin coating of wax, specially prepared, and upon this a design is marked with a sharp point or needle cutting down to the copper. Then the plate is dipped in a solution of nitric or other acid, which attacks the metal in the places where the wax coating is removed and corrodes it away rapidly. If the plate is left too long in the acid this will undercut beneath the wax and make broad lines. I mean to say that the acid will, of itself, give other effects than those intended by the etcher, and of course it removes some metal. The next shows a dry point line, no metal being removed, but only a scratch made, throwing up at one side the same amount of metal as is moved by the hard scratching point; the action is similar to that of a plough driving a furrow and throwing up a ridge. On the metal this ridge is called a burr, and it has a very important effect on a print as it catches a quan-

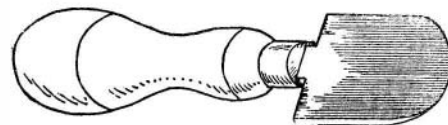


FIG. 2.—ROCKER.

tity of ink behind its sheltering crest, and produces a thick, soft effect on the paper.

The mezzotinting process removes no metal, except by accident, as for instance, when the rocking is carried too far, then the burrs will get so small that they are apt to tumble off and leave only a roughened depression.

The most distinctive tool used in the process of mezzotinting a metal plate is called a "rocker." It resembles a small spade, and is beveled at the broad end, which has a curved outline (Fig. 2). The flat side of the rocker is channeled finely or coarsely according to the wish of the engraver, and whenever the tiny teeth get worn down or perhaps broken in places, it is easily remedied by simply sharpening the edge as if it were a chisel, the effect of the channeling being to produce a toothed edge resembling that of a tooth-comb. In the early times of mezzotinting rockers were made so as to be used in the hand, but of late years an arrangement with a short pole has been substituted, and with this simple appliance it is much easier to roughen a plate than it was when the rocker was handled like a gimlet (Fig. 3). The rocker, as now used, is no doubt a development from a roulette. The first mezzotints were roughened by means of roulettes held in the hand. They were of many different forms, ranging from the small toothed wheel like the wheel of a spur, with a single line of points, to the broad disc, resembling a small garden roller, which was used by Prince Rupert and his followers. Between these two extremes the varieties of roulettes

* Paper read before the Society of Arts.

were many, and it is likely that each mezzotinter designed the form which he preferred for his own use (Fig. 4). Roulettes were first used to roughen metal plates by L. von Siegen, who found that they were able to produce an effect, rapidly and easily, which, if done point by point in the *pointillé* manner, would be slow and difficult.

The most valuable use of a roulette is not in its use alone, but as an accessory to rocked work; being quite small it is invaluable to deepen the roughening in particular places, and it is also of great use in the event of too much scraping having been accidentally done. In former days mezzotinters generally laid their own grounds, very often only working them where required, but now the whole of the plate is evenly covered with the rough grain, and this laying of a mezzotint ground is, moreover, done professionally, so that a modern engraver works on a ground with which he

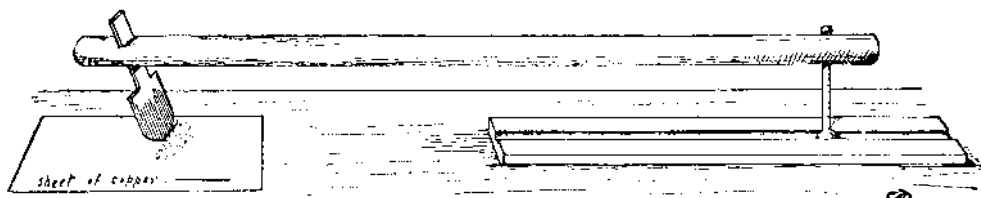


FIG. 3.—POLE ARRANGEMENT OF ROCKER.

is in doubtful sympathy. I think that the professional laying of a mezzotint ground militates much against the true art value of the work of any engraver who works upon it. It is, however, a slow and tedious process, the plate having to be crossed some eighty times, and in these days of hurry we must perforce forgive it, as very few mezzotinters could, or would, spare the time to do it for themselves as they ought to.

The next important tool used in the production of a mezzotint is a scraper (Fig. 5). Like the rocker, the scraper is of hard steel. It is a short, sharp cutting edge set in a handle, and by its use the mezzotinter scrapes away the roughness on his rocked plate as much as he considers necessary. If the scraping is carried far enough all the marks made by rocker or roulette can be erased, and every scrape, when printed, shows more or less as a light place. Scrapers should be very carefully kept dry, as the sharp edge soon loses its value if any rust gets on it, and instead of a clean sharp cut, it makes a jagged scratch. The main difficulty in engraving a mezzotint is in the use of the scraper, so much so that the phrase "scraped" by so-and-so is often heard referring to the engraver. Indeed it may almost be said, especially now that the grounding is usually done professionally, that the art of the mezzotinter consists of his skill with the scraper alone. There is, however, one more instru-

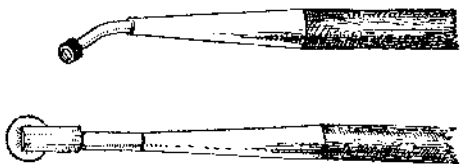


FIG. 4.—ROULETTES.

ment that is a dangerously powerful one. Dangerous because it can be made to do easily work of the same kind as can be done with some difficulty with the scraper. This instrument is a burnisher, and the work of flattening down the small roughnesses which are left by the scraper falls to its lot (Fig. 6). A burnisher is a more delicate instrument than even a scraper, because its own function requires a perfectly clear polished surface to work with. If there is the smallest speck of rust on a burnisher it is not safe to use it. Early mezzotinters were by no means so careful about this as they might have been, and the result can be seen in numberless instances where places intended to be pure white show hair marks along their length. Such marks are probably due to small inequalities on the surface of the burnisher.

A hard steel burnisher acting on soft copper which has been rocked, is capable of polishing out all marks, and consequently of creating a form on the plate which will show white upon a print. Such a small point will be, however, a depression on the copper, and although polished, nevertheless a layer of ink is always likely to remain in it, so it is advisable to go over all such points with a soft wooden point armed with a little whitening, in order to get every atom of the ink out. Such white spots can often be seen on the points of noses, and about the eyes, and for greater effect they are also often helped by the near neighborhood of burin work—sharp and black.

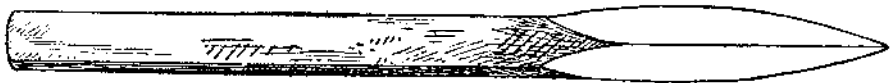


FIG. 5.—SCRAPER.

Practically, then, a mezzotinted plate is burred all over, and the art work upon it is done by means of scraper and burnisher, the effect of each of which is toward lightness. The more it is worked upon by these two instruments the lighter the print will be, and in a few places where greater strength of tone may be required, a roulette can be effectively used to restore the requisite darkness. Many fine mezzotints owe much to line engraving, dry point, and etched work, but when any of these are found in any considerable quantity the engraving should properly be called in "mixed manner."

Much importance attaches to the inking of a mezzotint plate, more importance than has been credited to it. A bad inker and printer cannot make a good print from the finest plate, and a good inker and printer can make a decent print from a very bad plate.

Mezzotints were printed in color at an early period in their history. Joannes Teyler, Professor of Mathe-

matics in the military college at Nimeguen, at the end of the seventeenth century, printed several of his plates in color, inking each plate carefully in the proper place with properly colored ink. Then, a little later, J. Christophe Le Blon began three-color work. He engraved a separate plate to carry each color, and used red, yellow, and blue, with sometimes a key-plate in neutral tone. At least one of these plates was mezzotinted, but they are sometimes etched. He described his process in a tract entitled, "Coloritto," published about 1723.

The finest color work of this kind is now done for the Société des Amis des Livres, at Paris; the registering of their plates is marvelous, and the effect beautiful. In England, Mr. Cadbury Jones endeavored some short time back to introduce color printing for metal plates in the manner of Joannes Teyler, the plates being inked in the different colors, but his en-

deavors did not meet with the success they deserved.

The early exponents of mezzotint work were all amateurs. The first mention of it is contained in John Evelyn's "Sculptura," published in London in 1662, and he says it was described to him by Prince Rupert. Prince Rupert engraved a small head of "The Executioner," taken from the larger plate, for Evelyn's book, and this is, I believe, the first mezzotint ever published as a book illustration. Evelyn does not describe the process, but it was described by Alexander Browne in a book called "Ars Pictoria," published by him in 1669. In this description no mention is made of a scraper, but the directions advise the use of a burnisher for lightening the plate.

Prince Rupert was for a long time considered to be the inventor of the mezzotint, but it is now known that Ludwig von Siegen, an officer in the Hessian army, used a system of engraving which ultimately developed into true mezzotint. An excellent account of Von Siegen and his invention can be found in Léon de Laborde's classic "Histoire de la Gravure en Manière Noire," and in this book is a facsimile of a letter which was sent to the Landgrave of Hesse, accompanied with a print of a portrait of his mother the Landgravine Amelia Elizabeth, executed in the new manner. This print, of which I have an excellent slide, is, in my belief, all worked by means of a small single-line dotting roulette. Von Siegen's letter is dated August 19, 1642, and his print is considered to be the first important mezzotint. In places where the

roulette has been used closely and strongly, a certain velvety effect is found, and this no doubt, being entirely new, gave the idea a start, which was followed up by Prince Rupert and others, and eventually became the chief characteristic of mezzotint work. I take it, however, that in all these early prints the mezzotinting or rouletting has only been done in the places where it was wanted, so that scraping was not necessary, whereas in a true mezzotint the rocking or roughening is systematically done all over the plate and afterward cut away by means of a scraper as required. In Von Siegen's letter there is no mention of a scraper.

Prince Rupert learned the new art from Von Siegen, and rapidly improved upon his master's work. Several of his plates are powerful and cleverly managed, the mezzotinting is only put where it is wanted, and there is little or no use of the scraper. The use of the burnisher on metal was well known in Prince Rupert's time, and any corrections he found it necessary to do upon his plates were probably done by means of this instrument. Prince Rupert most likely used a roller with a grooved surface to roughen his plates, and some of them show broad curved impressions from such an instrument. The early mezzotinters were not only amateurs but Dutchmen as well, the Canon von Fürstburg being a contemporary with Prince Rupert. Wallerant Vaillant, a Dutch portrait painter, assisted Prince Rupert, and himself worked a few plates in the new manner, but neither his work nor that of the Canon was particularly good. Under one of his plates, a portrait of Prince Rupert, occur the

words "Prins Robbert, vinder van de Swaarte Prent Konst." The Van Somers and Abraham Blooteling also worked in England; in the case of Blooteling this is particularly fortunate, as his work is in every way excellent, and in consequence of his working here so largely, we count him in the list of English mezzotint engravers. Blooteling was the first to perceive the great artistic possibilities of the new process of engraving, and he taught an assistant, Blois, to prepare his grounds, and these are well and evenly done. Also Blooteling used the scraper, which does not seem to have been used before in the particular way of lightening on all-over darkened plates. The question naturally occurs here as to whether it is possible to say from a print whether a pale place on a mezzotint has been produced by means of a scraper or by a burnisher. I have not time now to go into this question, but will only say that there are certain signs on all such pale places by which it can be said, with some cer-

tainly, how they have been produced. Blooteling came here in 1673, and his work quickly became much admired by line engravers, many of whom took up the new process as an amusement; but gradually its powers became more and more appreciated until at last our native engravers became so pre-eminently skillful that mezzotinting was known as an English art.

The early mezzotinters engraved principally after their own drawings, but very soon they became interpreters of the work of other men. At the same time, in a first-rate mezzotint, we must acknowledge a con-



FIG. 7.—"THE GREAT EXECUTIONER," ENGRAVED BY PRINCE RUPERT. 1658.

siderable amount of original merit, in addition to the skill of the copyist.

Like the Dutch, the first English engravers in mezzotint were amateurs, the two first being William Sherwin and Francis Place. Sherwin counts first because he dated one of his prints, a portrait of Charles II. "1669," and Place dated none of his, though they may have been done earlier than Sherwin's. Isaac Beckett may be considered the first English professional mezzotint engraver. He worked about 1670, and took pupils, among whom was John Smith, afterward one of our most famous engravers, and a very prolific one.

After Isaac Beckett, English engravers in mezzotint increased rapidly in number, and they gradually took the art away from its Dutch votaries; at the same time, the foreigners remained here for some time and executed much good work. Among these were some well-known artists—Vandervort, Verkolje, Van Bleek, and Van Haeken.

During the eighteenth century we do not find the same preponderance of Dutch workmen, but the English names occur almost exclusively. In the beginning of the century John Smith worked most successfully, and was followed by a numerous band of famous engravers,

many of whom, owing to the revived appreciation of mezzotints, are now well known.

John Faber, junior, is best known for his engravings after the portraits of the members of the Kit Cat Club painted by Sir Godfrey Kneller. The club was originally political, but soon lost that distinction, and the club-room in Jacob Tonson's house at Barn-elms was too low to admit the usual full-length figures, so Kneller made his canvases 36 by 28 inches, and christened this size of picture after the name of the owner of the original meeting-house, Christopher, or Kit Cat.

About 1714 George White inaugurated the introduction of etching into the mezzotint world; he strongly etched his subjects before putting in the mezzotint tones. This principle was afterward much followed especially in the case of large subject pieces.

A large proportion of eminent eighteenth century mezzotint engravers came from Ireland, the most eminent of whom was James MacArdell. He largely engraved after Sir Joshua Reynolds, who himself declared his



FIG. 8.—"MISS JACOBS," ENGRAVED BY J. SPILSBURY. 1761.

This mezzotint received the premium of fifteen guineas from the Society of Arts, in 1762.

belief that he would be immortalized by MacArdell's work. Then there was his fellow pupil with Brooks, Richard Houston, and Thomas Frye, who engraved large portrait heads after his own drawings about 1740. Other noted Irish engravers were E. Luttrell, Thomas Beard, W. Baillie, John Murphy (who, unfortunately, has only left a few rare plates, all very

fine), J. Brooks, Ed. Fisher, Ch. Spooner, J. Dixon, and Richard Purcell.

These engravers and their English contemporaries of the eighteenth century have left an unequalled series of magnificent portrait engravings after the works, particularly of Sir Joshua Reynolds, P.R.A., J. Hoppner, R.A., Sir T. Lawrence, P.R.A., G. Romney, and T. Gainsborough, R.A., all notable for the beauty of their female types, and in the matter of subject pictures they have engraved chiefly after the works of G. Morland, W. Hogarth, Benjamin West, P.R.A., and J. Zoffany. Among the most notable of the English mezzotinters of the latter half of the eighteenth century, Valentine Green is one of the best known. He had several pupils of whom John Dean, one of the most delicate of engravers, is perhaps the most eminent. In 1777, Richard Earlom engraved a set of mezzotinted etchings after Claude Lorrain, one of which I have to show you as an experimental slide. J. R. Smith, son of Smith, of Derby, was one of our greatest engravers in mezzotint; he made some plates after his own drawings, but is chiefly known for his beautiful interpretation of the works of Sir Joshua Reynolds.

J. Walker, Jonathan Spilsbury (Fig. 8), and C. Turner were all first-rate engravers in mezzotint. C. Turner was a relation of J. M. W. Turner, our greatest landscape painter, and he assisted his eminent kinsman in the engraving of some of the plates of the "Liber Studiorum."

During the early part of the nineteenth century portraiture still maintained its supremacy, but the application of a mezzotint to landscape art is characteristic of a later period. S. W. Reynolds, a pupil of J. R. Smith, was a very successful and skilled engraver. He engraved a series of 357 small mezzotints after the work of Sir Joshua Reynolds. These small plates form an illustrated index of Sir Joshua's work as far as S. W. Reynolds could find it. They are, however, not quite satisfactory, as the process of mezzotinting does not suit very small work any more than it suits very large work. S. W. Reynolds also engraved several plates after his own drawings.

William Say is noteworthy among the earlier nineteenth century engravers, as he executed a small portrait of Queen Caroline in 1820 which is the first mezzotint engraved upon steel. Underneath the first proof made from this plate is a note: "This attempt to engrave on steel was made in 1820.—W. Say." The portrait is not very pleasing, but many mezzotinters have worked in steel since with much success. No doubt the great durability of steel is much in its favor, but there are several technical difficulties connected with its actual use for engraving upon directly, and this has led to the modern evil of mezzotints engraved upon copper being covered with a thin film of steel, so as to give them a lengthened life. From such a steeled plate an infinite number of identical prints can be drawn. From mezzotints engraved upon a copper plate about fifty prints of the finest quality can be drawn, after that the plate begins to deteriorate. The beauty of a print from a copper plate is a rare beauty; that of a print from a steeled plate never can be rare, neither is it equal in quality to a print made before the steeling operation was done. There are certain checks upon the indiscriminate production of prints from steeled plates, but I doubt if they are reliable.

J. M. W. Turner no doubt admired R. Earlom's etched mezzotints of Claude Lorrain's "Liber Veritatis," and it appears likely enough that this gave the former the idea of his "Liber Studiorum," issued in parts between 1807 and 1819. Turner made small sepia sketches, from which he etched the outlines on copper, and then had the light and shade filled in by various engravers in mezzotint or aquatint. Turner himself mezzotinted some of them. Of their kind they are the finest things that have been done, and they have always been favorites with collectors because of the difficulty of getting a complete set of proofs. Turner issued the prints in sets, "prints" and "proofs," but, as a fact, they were all mixed, so that to get a real set of proofs together involves a long search and much tribulation.

Quite recently Mr. Frank Short, best known as an etcher, produced a few etched and mezzotinted plates from sketches by Turner, done in the same manner as the old ones, to which they clearly approximate in every way.

T. G. Lupton was the first mezzotinter to work largely upon steel, and he chiefly engraved landscapes. For his success in working this process upon soft steel he received the medal of the Society of Arts in 1822. His work is, I think, the most pleasing of any mezzotinted landscapes; this is partly due to the fact that he used a brown ink by preference. Brown ink is troublesome to manage on steel. I think, altogether, that landscapes are hardly satisfactory in mezzotint, but that the finest effects are to be found among the splendid series of full-length portraits of ladies, after Sir Joshua Reynolds, or one or other of the artists of his period. Three-quarter lengths are perhaps the more usual form in portraiture, both in portraits of men as well as women, but there is a completeness about a full-length, which is necessarily wanting in a portrait representing any lesser degree.

David Lucas is particularly known for his interpretations in mezzotint after the landscapes of John Constable, R. A. They are, as a rule, too dark, and are printed in black ink. Sometimes pleasanter prints have been drawn from a worn plate than from a new one, as they are paler. At the same time the original pictures are dark, but I think that if Lucas had used a browner ink, as Lupton did, his landscapes would have been pleasanter. He nearly always engraved on steel. Lucas died in 1881.

Samuel Cousins brings us up to modern times; he gave up work in 1883. His work is always delightful. In 1814 he was apprenticed to S. W. Reynolds, and presently set up for himself at 104 Great Russell Street. He engraved largely both portrait and subject pieces, and his plates are very fully etched before the mezzotinting is put on them. His style may be considered as the modern one, as it has formed the keynote for most of his successors. A large plate, engraved by him, after Landseer, "Bolton Abbey," executed quickly and very effectively in etching and mezzotint, is supposed to have given the death-blow to the

old-fashioned, slow, and expensive process of line engraving. It was published in 1837. He engraved largely upon steel.

Mezzotints can now be very efficiently copied by means of photogravure, a form of etching, and probably this process may yet attain greater perfection. At present it leaves something to be desired in the matter of brilliancy—there is too much loss of light. But a photogravured plate can be worked over to almost any desired extent by rocker or roulette, burnisher and scraper, so that it can be made almost identical with the original. A photogravure made direct from a painting is often very good, but here, again, it generally needs a little skilled handwork in weak places.

What with steel-plating of copper plates, and the direct competition of photographic processes, it is probable that mezzotinting as a high art has had its day. Except for the work of a very few living engravers of the first rank in this method, mezzotinting has already reached its highest development, and we may well be proud of the beautiful examples which have been left to us by MacArdell, Valentine Green, J. R. Smith, and others of their period, men whose talent has been great enough to earn for their particular art of engraving the title of *la manière anglaise*.

ELECTRICAL NOTES.

The Mayor and Aldermen of the City of Launceston, Tasmania, are prepared to receive tenders for the supply of 500 or more electric meters. Specifications and conditions of contract in duplicate may be obtained on application to Mr. William Corin, City Electrical Engineer, Launceston, Tasmania, or to Messrs. John Terry & Co., 7 Great Winchester Street, London, E.C., England, on payment or £2 2s., which sum will be refunded on receipt of a *bona-fide* tender. Sealed tenders, indorsed "Tenders for Supply of Electric Meters," must be addressed to Mr. C. W. Rocher, Town Clerk, Town Hall, Launceston, Tasmania, and lodged in his office not later than 12 o'clock noon of Monday, September 28, 1903.

In L'Industrie Electrochimique the Becker and Cowles processes of electrically manufacturing sodium are described. The Becker process depends on the decomposition of sodium chromate, tungstate, etc., and carbon in an electric distillation furnace, the sodium being distilled off and being condensed afterward, while metallic chromium remains. By treating mixtures of different salts and oxides, it is possible to produce alloys. The Cowles process depends on the reduction of sodium aluminate with the production of aluminium carbide and metallic sodium, which distills off and is condensed as above. If iron or copper is added to the sodium aluminate, ferro-aluminium or cupro-aluminium is obtained instead of aluminium carbide.

The results of some interesting experiments on the leakage currents from electric tramways to gas and water pipe systems are described by A. Larsen in a German contemporary. For the purpose of the tests, pieces of iron tubing were placed in earth, and currents passed from them through the earth to surrounding cylindrical iron mantles; the earth was moistened from time to time, and in some instances impregnated with salt. The amount of corrosion was determined by scraping and reweighing the pieces of iron tubing from time to time. From the data it appears that the loss of weight of the tubes per ampere-hour was independent of (1) the current density, (2) the voltage, (3) the nature of the iron (whether wrought or cast), (4) the presence or absence of salt, (5) the character of the current (whether steady or intermittent). The electromotive force of polarization was proportional to the working electromotive force, and manifested itself as an apparent increase in the resistance of the earth.

A bulletin was recently issued by the United States Census Office on the statistics of the street railway industry of the United States, which is made the subject of some elucidating remarks by the Electrical World and Engineer. The totals which are presented in this report are truly imposing, revealing tremendous advances in the last ten years, with consequent benefit to the public without a single drawback worthy of the slightest consideration. It is interesting to note that the total capital obligations of the industry represented at the time the figures were compiled last year, a total of not less than \$2,300,000,000, with 22,589 miles of track and over 60,000 passenger cars. One of the most interesting figures which emerges is that of earnings, the companies showing gross receipts from operation of \$247,553,000, of which all but \$14,000,000 was received from passengers. The total receipts from passenger earnings of the steam railroads of the country for the same annual period were only \$393,000,000. Upon the basis of the population of 1900, the average number of street car rides per inhabitant was 63 in 1902, or just double what it was in 1890. It appears upon this basis and upon the figures of earnings, that the average expenditure per head in the United States for street railway service is just about \$3, and that the enormous number of 4,809,554,438 fare passengers were carried in 1902. It is needless to say that this enormous expansion of traffic and utility is wholly due to the introduction of electricity. It is also interesting to note that the system for the 797 companies reporting the figures, out of 817, showed 133,641 wage earners, whose income amounted to \$80,000,000. It is altogether inconceivable that but for the aid of electricity the street railway system of the country would have been able to give employment to so many men of a higher grade, and under better conditions, than those who once drove horse cars. Equally interesting are the figures with regard to motive power, car equipment, etc., showing a total power house capacity of 1,204,238 horse power of dynamos, and a daily kilowatt-hour output of 6,249,910, representing roughly a total operation of about five hours daily of all the apparatus reported. And yet great as these figures are, it is evident to the most casual observer that ten years hence the statistics are likely to show as great an increase as those of 1902 have shown over those of 1890 in the application of electricity to the transportation of the traveling public in cities, as well as outside city limits.

MISCELLANEOUS NOTES.

Herr B. Weinberg, of the University of Odessa, has collected about 130 of the more trustworthy values of the solar parallax as obtained by different observers, using various methods, since 1825, and has discussed them in a paper communicated to the Astronomische Nachrichten. From the discussion he has obtained 8.8004 inches with a probable error of .00243 inches as his final value for this constant.

P. Lemaire has examined the bark of *Richeria grandis*, which, under the name *Chalufouria racemosa*, "Bois bänder," "Bois d'homme," and many other names, has a wide reputation as an aphrodisiac. The author finds, however, that this is ill-founded. It contains no alkaloid or any other active principle. Petroleum ether removed from it a crystalline body, occurring in hexagonal scales melting at 237 deg. C., but which were devoid of physiological action. Besides this, nothing but reddish brown coloring matter, tannin, and glucose were isolated.

The term "mineral zone," as used in contradistinction to a "mineral vein," refers to the fact that a mineral zone is not always clearly defined, as by walls. The mineralization may extend along one or both sides of a fissure having no defining limits, while a vein is presumed to be situated wholly within definite bounding planes and may be easily distinguished from the adjoining country rock. In a zone of mineralization the mineralization may gradually disappear as distance from a central crack or fissure increases until it ceases altogether. A mass of rock within which occur several veins or ore bodies is also often referred to as a zone.—Mining and Scientific Press.

In the Journal of the American Chemical Society, H. W. Hillyer discusses the physics and chemistry of soaps and their cleansing power. From study and experiments he draws the following conclusions: "The cleansing power of soap is largely or entirely to be explained by the power which it has of emulsifying oily substances; of melting and penetrating into oily textures; and of lubricating texture and impurities so that they may be removed easily. It is thought that all of these properties may be explained by taking into account the low cohesion of the soap solutions and their strong attraction, adhesion, or affinities to oily matter, which together cause the low surface-tension between soap solution and oil."

Seidlitz salt is one of the many old names for magnesium sulphate, says the Druggists Circular and Chemical Gazette. It has at various times been known as seidlitz salt, egra salt, canal salt, bitter salt, cathartic salt, English salt and Epsom salt. Its earlier source was from the salt springs of Epsom in England and from this fact it took its last two names. For a long time sea-salt makers supplied the markets of the world. They procured it as a by-product in the making of salt. The bitter water that remained after the table salt had been crystallized out was found to contain it. Now it is chiefly procured from such minerals as dolomite, silicious magnesium hydrate, and schistose rock containing the sulphide of magnesia. Many medical men deem it our best saline cathartic.

The chief constituent of true cinnamon oil as well as oil of cassia, is known to be cinnamic aldehyde. Other known constituents are phellandrene and eugenol, but a mixture of these three substances does not yield a product having the delicate and characteristic odor of cinnamon. Schimmel & Co. have patented a method for producing an oil closely resembling that of true cinnamon, which involves the use, in addition to the three substances mentioned above, of normal amyl-methyl ketone, nonylaldehyde, cuminaldehyde, caryophyllene, linalool, and its butyric ether, cymol, benzaldehyde, phenyl-propyl aldehyde, furfural, pinene, and eugenol methyl ether. All these have been recognized as constituents of true cinnamon oil, and the first six are of most importance in reproducing an odor resembling that of the natural product.

There are 159 omnibus routes in London, of an aggregate mileage of 757. In the central streets the buses form more than a third of the vehicular traffic. Altogether they carry 480,000,000 passengers a year. At some points nearly between 600 and 700 buses pass every hour, and the traffic has not been seriously interfered with by the tubes. The Central London has affected the buses, but new routes are always being opened up. Omnibuses are slow, the fares are high—35d. per head more than tramway fares. Unlike railways and tramways, they have no preferential tariff for workmen, yet the present inconvenient, uncomfortable bus, or its successor, the motor bus, is likely to remain a familiar sight in London. Electric cars and tubes will compete in the main routes, but the buses will open up new routes in the outer zone, develop cross routes, and, by adapting themselves to changed conditions, maintain a place in our means of locomotion.—Municipal Journal.

Prof. E. Dorn, of Halle University, communicates to the Physikalische Zeitschrift an interesting observation lately made by himself. Having introduced about 30 milligrammes of radium bromide in a Sena glass bulb, that eventually was sealed, the author wanted to open this bulb six months afterward. Now, at the very moment of the file scratching the surface of the glass, the tube was pierced by an electric spark, producing quite a considerable noise. Though the author stood by the window, on a bright summer afternoon, he was struck by the intensity of the spark, the noise being so strong that the mechanic of the laboratory, who stood in the midst of the room, would ascribe it to the discharge of an induction coil, which, by the way, was not even connected to the battery. In order to explain this singular phenomenon, the author presumes that the negative ions, having traversed the walls of the bulb, had escaped outside, leaving the positive ions inside of the bulb. On the outer surface of the latter, there had next occurred an accumulation of positive electricity, derived from the atmospheric air ionized by the radium emanation or conveyed by surface conduction. As Prof. Dorn would hold the bulb with the left hand, and the metal of the file with his right, the conditions necessary for a discharge were given.