prints are made, or whether they are mounted on cardboard or zinc.

The simplest way is, of course, re-impression by means of moist or semi-moist papers, since the plate can then remain dry. For gelatin papers, as well as for the transparent papers, a uniform, very slight moistening of the aluminium plate is necessary. Too much moisture prevents the transferred color from adhering to the metal, so that upon washing out and rolling in the surfaces appear uncovered and the whole reprint disappears gradually when printing from it. A correctly manipulated reprint on aluminium, however, will admit of printing larger editions from it than from stone. Defective re-impressions, however, should never be passed into the hands of the printer, as they quickly become entirely useless.

In transferring autographs, the result depends upon the quality of the original, the same as in lithography. Old autographic ink should never be used for writing or drawing. It is better to use freshly ground lithographic or India ink, or both mixed together. It is essential that the lines made on the paper should still show luster after drying. As regards the paper, only well-sized paper should be used; for traced drawings and plans vegetable paper, not oil paper. The best adapted for re-printing, however, is the autographic paper prepared with a coating of paste.

For pantography or reductions with the gum film, the original plate should be pasted upon a firm support. For this purpose take a smooth sheet of paper of the same size as the plate and paste it firmly on the underlay of stone or iron, paint the sheet again with gum, lay the plate on top and weight it for a little while. In 10 or 15 minutes it is firmly enough attached to make impressions from it on the gum skin without drawing up the plate when the film runs off. In the coating used for pantographing of aluminium, a few drops of glycerin should be used.

The reduction transferred again upon aluminium is then treated further as described above for re-impression.

Heliotype reprinting especially in connection with aluminium is likely to become an important factor in chromotypography. This process may be applied to colored plates as well as to final or drawing plates. The utilizability of heliotype in the algraphic branch is founded upon the production of a grain suitable for re-impression as well as for subsequent printing and approaching that of a crayon drawing. The formation of the grain is accomplished by admixing a grain-generating reagent to the heliotype preparation. If such an object is to be reproduced, a photographic picture has to be taken of it from which, with the aid of the heliotype process, a picture suitable for algraphic printing can be produced.

Only a few years ago I succeeded in discovering a process to raise the text and designs on aluminium, by sharp etching, thus obtaining a relief, similarly as in lithography, which facilitates the inking and furnishes a rich impression even with moderate cylinder pressure. The relief produced on aluminium, however, does not furnish the same advantages in practical printing, and only by the use of extensive machinery can the relief be removed again, which, besides, renders the plate so thin that a repeated use for the same purpose is impracticable.

Hence, high-relief etching is excluded in practice, but can be readily dispensed with, if the machines are strongly built and the printing cylinder has sufficient tension, since the fragility of the stone has no longer to be taken into account. But since high-relief etching has been unknown heretofore, I will give the process for the sake of completeness; perhaps it may be useful for other purposes. The printing surface to be etched in high relief is blacked with ordinary pen-ink, and then sprinkled with rosin or powdered asphalt; the superfluous powder should be removed by wiping with talcum before it is fused on with the lamp. When the design has thus been thoroughly protected against acid, it can be etched in relief with cuprous chloride. For this purpose dissolve enough concentrated cuprous chloride (crystallized green needles) in water, until it is completely saturated without a sediment. Of this solution, which is of a deep green, take 1 part to 6 parts of water, adding 1-10 part of acetic acid. The etching liquid now finished is pale blue.

For printing from aluminium all strongly built lithographic presses are adapted, but, favored by the excellent qualities of aluminium for printing purposes, an old idea of applying flat printing to rotary machines has finally been carried into effect. As far back as in the sixties, the Parker Arms Company, of Meriden, Conn., erected a machine constructed after the pattern of the rotary book printing press, the cylinder being of lithographic stone. A special machine scraped off the stone when a fresh re-impression was to be mounted, which was again performed by specially constructed machines. The first rotary press for flat printing was very small in size, but is said to have done good work. It soon fell into oblivion, however, since it was too expensive and too difficult to serve.

Meanwhile, zincography has gained many adherents; here and there tolerable printing was done from it in the hand press, which doubtless furnished the incentive to try rotative printing with zinc plates. Germany and France could not find any buyers for their machines, but in the United States the Huber Rotary Press Company was successful in introducing their zinc rotary presses, it is true, only for inferior work, large posters, etc. The Americans took up the perfecting of these machines with renewed energy, when Mullaly and Bullock received a patent on printing from aluminium. Simultaneously the aforementioned process had been invented in Germany, for which patents had also been taken out abroad. The results obtained with the Mullaly process, however, were such that when the German patent had been bought up in America, its introduction was general and the construction of rotary printing presses assumed undreamed-of proportions, which, however, did not take place in Germany.

Four of the largest machine construction companies of America now supply rotary presses for aluminography; the number of machines put in service in a short space of time in the United States amounts to 150 to 160. One establishment alone has fifteen in operation. The United States also supply Japan, Australia, England, France, and South America. The predominating system of the American rotary press shows two constantly rotating cylinders of equal size, a laying-on board with fixed marks, and the well-known layer or lifter, as is used by the book-printers in their machines. The machines latterly constructed in England are built after the American principle without showing a notable improvement. The price of these machines as compared with that of the Americans is remarkably low, but despite this fact two-thirds of the forty rotary presses set up in England are of American origin.

In Germany the first rotary machine for zinc was built in the sixties by the Johannisburger Maschinenfabrik, but without success, nor did their aluminium rotary presses, built in 1896, find any buyers. Only in 1898 a Würzburg factory succeeded in awakening interest with a new system. It is worth while to describe it more fully, as it is at present the only one that has been successfully introduced in Germany, Italy, and Austria. Its print is neat and of good register; it allows of a quick change of plates; can be cleaned conveniently and quicker than other systems, for which reason it is also useful for small editions. The printing cylinder is arrested for the purpose of a new laying-on; the laying-on is done into the grippers of the cylinder on corresponding marks provided there. The printed sheet is passed out through two drums with the printed side up. The plate cylinder carries on one-half the aluminium plate; the other half is used as moistening table on which the damping or wiping rollers respectively rub out their water. For inking, the old system is retained; the distributing cylinders are situated on the inking cylinder, which is moved to and fro laterally and feeds two large rubber cylinders, whose circumference corresponds to the size of the printing surface, whereby even the largest surfaces are covered uniformly. The action is very quiet for a machine with stop cylinder, which is to a great extent due to a cylinder brake.

There is another rotary machine, constituting a combination of the aforementioned and the American systems, in which the Offenbacher Maschinenfabrik is placing great hopes. Simple in the serving and solid in construction, this machine has, despite its eminent advantage over the flat printing press, a low printing velocity; thus, for instance, the impression cylinder has the same revolving speed when making 20 impressions per minute as the printing cylinder of a flat printing press of the same size making 14 impressions per minute. The laying-on and laying-off boards are on the same side of the machine. By this arrangement, the front side at the roller is perfectly free, thus rendering access to the aluminium plate very convenient. A newly patented peculiar taking-off contrivance conveys the sheet without the printed side coming in contact with ribbons, rolls, or laying-off rods. The machine also has two large rubber rollers and a stop cylinder with hard pressure, without springs.

The German machines confine themselves to printing only one color at a time, while the American factories now furnish machines which print two and more colors in succession, without the sheet leaving the printing cylinder, but this class of machines seems only adapted for very special and large editions, since the equipment and serving must needs present some difficulties, both as concerns the machinery and the printing.—Translated for the SCIENTIFIC AMERICAN SUPPLEMENT, from the German of Weilandt, in Der Stein der Weisen.

MANUFACTURE OF LANOLIN.

THE text of the patent issued to Braun and Liebreich, January 23, 1883, is as follows:

"Many attempts have already been made to obtain the purest possible fat from raw woolfat, or from the wool-washing water. The methods used heretofore, however, are ineffective, since in the most favorable case the product obtained is sour and has an unpleasant odor, and if benzin, petroleum ether, or other like materials are used for the extraction of the fat the odor of the extracting medium also adheres to the product. The reason of this unsatisfactory result is due partly to the carbonic acid which is always evolved by the decomposition of alkaline liquids, and which attaches itself in small bubbles to the little particles of dirt adhering to the fat and carries up a large portion of the heavy earthy admixtures of the fat, so that upon the sour liquid a dirty muddy mass is formed, from which fat can only be obtained by pressing under heat. Furthermore, during the progress of the operation the lyes pass over into putrid fermentation, causing annoyance to the neighborhood and imparting to the resulting fat an obnoxious odor which cannot be removed. Moreover, this method requires much space and a considerable quantity of acid, because the earthy portions, which always contain decomposable lime salts or silicates, must be saturated with the acids necessary for the separation of the fats. Furthermore, there is a loss of material, due to the portion of the fat which remains in the press-cakes. By our method we are enabled to obtain, first, means for the separation of the dirt and unsaponified fat from each other and from the soapy water before the latter has been decomposed by acid; second, means for the production of lanolin, or of a new compound formed of purified woolfat and water, as above stated.

"In carrying out our invention we proceed as follows: The fresh undecomposed waste liquor or lye is passed through a centrifugal machine, in which the dirt and the fat are separated from each other, while the cleansed soap-liquor is continually drawn off by means of a pipe and led directly into the vat which serves for the acidulation. The raw lanolin thus obtained is thoroughly kneaded by suitable machinery in cold flowing water until the water which flows off is as clear as the water which flows in. The raw lanolin is then heated with water, whereby it is split up into water and fat. The latter is skimmed off from the surface and cooled, and for further purification it can be again treated in the centrifugal machine in a melted condition, or it can be dissolved in ether, ethylated or methylated spirits, or other solvents, and the solution can be separated from the residue by filtration or other means. The solvents can be recovered by treatment in suitable stills. After the fat has been cleaned, as above stated, it is thoroughly kneaded with water for a long time, and a perfect white neutral colorless unguent is obtained which is our new product. From the mud deposited in the lowest part of the centrifugal machine a still further portion of lanolin can be obtained by stirring the same up with clean or salt water and again treating it in the centrifugal machine or extracting it, either in a wet or dry condition, by means of a solvent, after which it is treated as before.

"Instead of producing our lanolin from wool-washing water it may be obtained from commercial woolfat by stirring this wool-fat together with water containing carbonate of soda or caustic soda, or any alkali, or a mixture of these to form a thin milky solution, which is treated in the manner above described.

"We are aware that wool-oil has been obtained by acidulating the alkaline waters used to remove grease from wool, collecting the gelatinous substance obtained, and treating it with a fixed or volatile oil, the latter being afterward driven off by distillation; also, it has been obtained direct from the wool by washing it with volatile oil or sulphuret of carbon and employing gentle heat, as well as by other methods. All these processes are, however, subject to the objections already mentioned, inasmuch as they affect the product either by the odor adhering thereto or by its positive deterioration in quality, or both."

THE SIMPLON TUNNEL AND ITS CONSTRUCTION.

THE London Engineer contains a description of the forms of timbering employed in the Simplon tunnel.

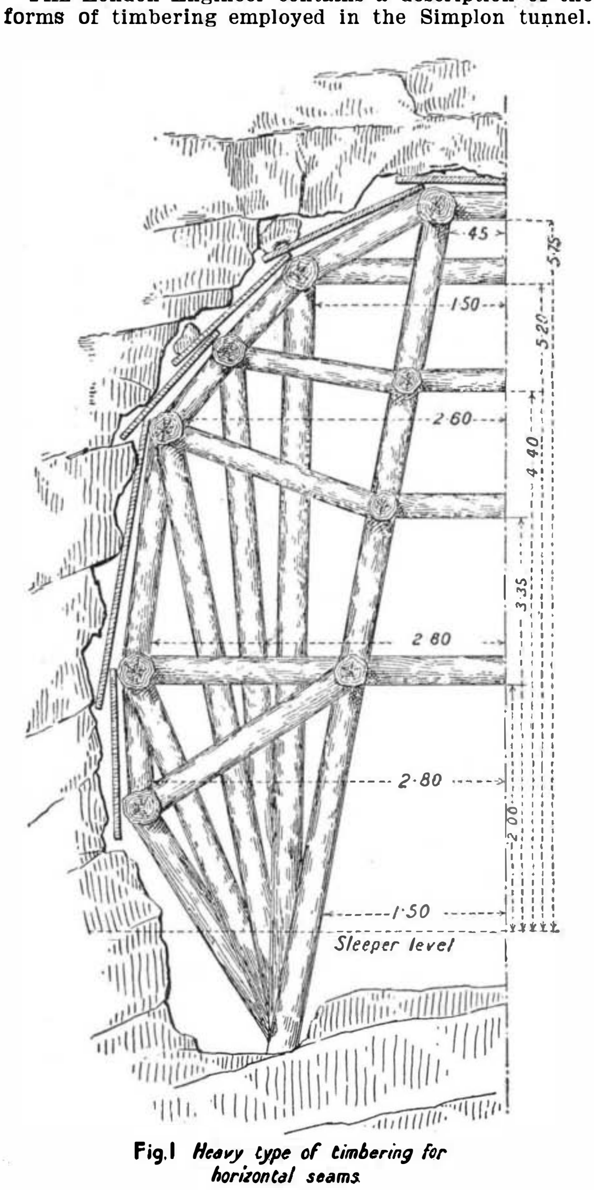

Fig. 1 *Heavy type of timbering for horizontal seams.*

We have abstracted that portion of the account which should be of most interest to our readers.

It should be noted that for reasons of safety the whole of the tunnel No. 1 throughout was timbered, even where the rock was solid and firm; but the spacing apart of the arch timbers has naturally varied with the character of the stratifications, and thus 10 feet, and even 8 feet only, have sometimes been allowed between centers. The forms of timbering differ somewhat even for a rock of the same nature; for example, where seams, although subject to no real pressure, lie horizontally, the superficial refrigeration of the warm rock in the tunnel has been apt at times to cause a sudden detachment and fall of layers—once with fatal results—and therefore, in such cases a stronger form of timbering has been necessary, together with a closer spacing—sometimes of the type given in Fig. 1. But the long struts used in this construction are not easy to handle in the tunnel, and in another form of framing, wherein the same angle is observed for the central posts, the timbers are shortened by one-half—that is, at the principal transverse beams, extending the full width of the enlarged tunnel, and dividing the wall section from the arch section, the latter being subdivided into seven segments. The primitive stage of this last-mentioned style of timbering is to be seen at the tunnel's mouth.

Masonry.—Wherever possible, it is sought to maintain the masonry following close up to the work of enlargements; but the varying nature of the rock traversed causes frequent disparities in the rates of progress of the two operations. Before reaching the difficult portion of the tunnel, 4,450m.-4,490m., the enlargement was in general 400m. ahead of the walls,