UNITED STATES PATENT OFFICE.

OTTO CARL STRECKER, OF DARMSTADT, GERMANY.

PROCESS OF PREPARING LITHOGRAPHIC-PRINTING PLATES.

SPECIFICATION forming part of Letters Patent No. 703,096, dated June 24, 1902.

Application filed July 5, 1901. Serial No. 67,175. (No specimens.)

To all whom it may concern:

Be it known that I, OTTO CARL STRECKER, a subject of the Emperor of Germany, and a resident of Darmstadt, Germany, have invented certain new and useful Improvements in Processes of Preparing Lithographic-Printing Plates, of which the following is a specification.

Metal plates for printing-plates may be coated with a hygroscopic layer by submitting them as electrodes to an electrolytic process, which conveys thereto in the form of ions the molecules necessary for the formation of the layer. For the electrolyte the salts of those acids which form insoluble and hygroscopic salts with the metal of the plate are chiefly used, such as phosphoric and fluoric acid. I could as well use the acid salts and neutral salts which produce acid salts when decomposing under the conditions as given in the description later on; but there are certain objections to this method, because an effectual coating by these electrolytes can only be obtained by using special precautions. The same result will be obtained when applying the said salts in solution to the metallic printing-plate. They will react in the same way and only by precautions an effectual coating will be obtained. There is besides the inconvenience of the development of hydrogen the production of acid salts caused by the hydrogen and there is alkali set free, which is also a cause of trouble and precipitates, partly adhesive, partly non-adhesive, are produced, which do not repel the grease (probably because they contain basic salts and hydroxids) and would consequently cause smears in printing. The whole proceeding for the formation of a useful coating is unsatisfactory, as will be seen from the equation of the reaction given below. As all these phenomena appear to stand in relation to one another, it might be fairly assumed that by the addition to the solution of acid and oxidizing substances adapted to combine with the nascent hydrogen and alkali a good result would be obtained and the objectionable features removed. As a matter of fact, by these means not only has the formation of hydrogen and alkali been prevented, but a useful and stable coating has been given to the plate. This action may be explained by reference to the action of acid fluorid of ammonia, (NH_4F+FH,) being a stable and crystallized compound, (Dammer, *Handbuch der Chemie*, II, 262,) on metal, (Me,) which is to be regarded as diatomic, and then to the action of the same salt with the additions of oxidizing agents and an acid substance. The first method is represented by the following chemical equation:

$$3Me+2(NH_4F+FH)+2H_2O= 2MeF_2+Me(OH)_2+2NH_3+6H.$$

The free ammonia would be as objectionable as the hydroxid group by causing smears in the printing. By means of a simultaneous addition of nitrate of ammonium and tartaric acid the reaction is satisfactory and uniform.

$$2Me+2(NH_4F+FH)+2NH_4NO_3+C_4H_6O_6= 2MeFl_2+2NH_4NO_2+C_4H_4O_6(NH_4)_2+2H_2O.$$

The result is an insoluble metal fluorid on the plate and substances soluble in water are left behind. As salts for the solution I use the acid ammonium salts of suitable acids, and as an oxidizing agent nitrate of ammonium will be found the simplest. However, any suitable equivalent salts and oxidizing means may be employed. As an acid substance arabine, which is chiefly contained in gum-arabic, is preferably employed, but tartaric acid and similar substances, which influence neither the lithographic manipulation nor the chemical bodies, may also be used.

A metal plate, preferably of zinc, is prepared for the transfer by grinding it by means of emery and pumice-stone powder of coarse grain (two parts of the first, one part of the second) and a pad of steel-turnings covered by a soft bit of leather in order not to hurt the fingers by cutting with the sharp-edged but carefully-selected turnings. Before grinding begins the plate has been washed with a mixed solution of acid fluorid of ammonia and ammonia (five ounces of the former and three ounces of the latter to one gallon of water) to remove grease, impurities, and oxid. The plate is washed with water and then ground with the pad described. The grinding is done so that the pad with emery and pumice-powder and water is moved over the plate in a rotative movement until the surface has become of a white and soft

appearance, (for grinding one yard square about twenty-five minutes may be required.) The zinc is then washed and finally treated with acidulated water, (fifty drops of nitric acid to one pint of water,) rewashed, and made dry. The zinc is then provided with a transfer or design, which after being fixed on the plate is gummed with a solution of gum-arabic of medium strength. This gum is made dry, and then the transfer is washed out with a solution of asphaltum in benzene or spirits of turpentine, generally known as "lithophine," over the dry gum, which afterward is dissolved with water, leaving the negative as a layer of asphalt on the plate. By the well-known method this is inked well with strong printing-ink by means of the roller. Then the alterations and corrections are made. Again the plate is inked and gummed and made dry. The gum washed off, once more the plate is inked up by the roller, and now very finely-powdered rosin is spread on the plate, which had previously been made dry. The excess of rosin is dusted off by means of a cotton pad and talc. Now the solution for coating purposes is applied, and the best composition for applying on zinc plates is the following: Twenty-two parts of ammonium acid phosphate, twenty parts of nitrate of ammonium, and two hundred parts of gum-arabic are dissolved in water to obtain one thousand parts of fluid, or one may use a combination of equivalent mixtures of salts of equivalent weight proportions with the quantity of gum-arabic and water above specified. With other metals equivalent suitable salts must be selected. Generally speaking, there is no difference in the method of use. The solution is applied by means of a fine hair-brush and allowed to act upon the zinc or other metal in the course of two to three minutes, while the solution is brushed frequently over the plate to cause it to improve and strengthen the layer. By the joined action of an acid salt of the acids described the oxidizing means and the acid substance on the metal an hygroscopic layer is coacted substantially and adhering firmly to the plate, which layer is insoluble and attracts the water and repulses the grease. When the time of action for the chemical substances has passed over, the remaining solution is washed off, the plate is made dry, and is then gummed. Then the process of coating may be repeated, and finally the plate after gumming is made dry and is then ready for use. In the case that a plate was furnished with its coating before printing thereon a transfer or design it will be necessary to remove the gum and wash the plate well or wash with a solution of alum first and then with water when zinc was used or with other means on other metals. Zinc plates may also be washed with a weak solution of soda to neutralize the gum or the action of the mixture of the salts used. For printing purposes the gum is washed off with a good quantity of water, the plate made dry, and spirits of turpentine are applied to remove or dissolve the printing-ink. Then this dissolving means is wiped off and a good quantity of water mixed with it in order to separate the greasy design from the hygroscopic layer. Finally the plate is washed well with a sponge and water and the printing in the machine may begin.

I do not restrict myself to this description only. The process may be varied. When done cautiously, a good and fair success is always to be expected.

Having fully described my invention, what I claim, and desire to secure by Letters Patent, is—

The process of preparing metal plates or alloys for lithographic printing and other purposes consisting in submitting the well-ground plates, which are provided with a lithographic design or transfer or the like, to the treatment of a solution which acts with and is acted upon by the metal used, and which is composed from a salt or salts the acids of which form insoluble compounds with the metal applied, and an oxidizing means, preferably nitrate of ammonia and an acid substance, which does not decompose the salts of the solution or set an acid free, forming thereby an insoluble hygroscopic layer firmly adherent to the plate of the metal or alloy, substantially as described.

In testimony whereof I have hereunto set my hand in presence of two witnesses.

OTTO CARL STRECKER.

Witnesses:

WALTER SCHUMANN,

WALTER HAÜSING.