Oct. 4, 1938. M. F. SCHEFFLER 2,132,086

PRINTING APPARATUS

Filed Feb. 11, 1938

Fig. 1.

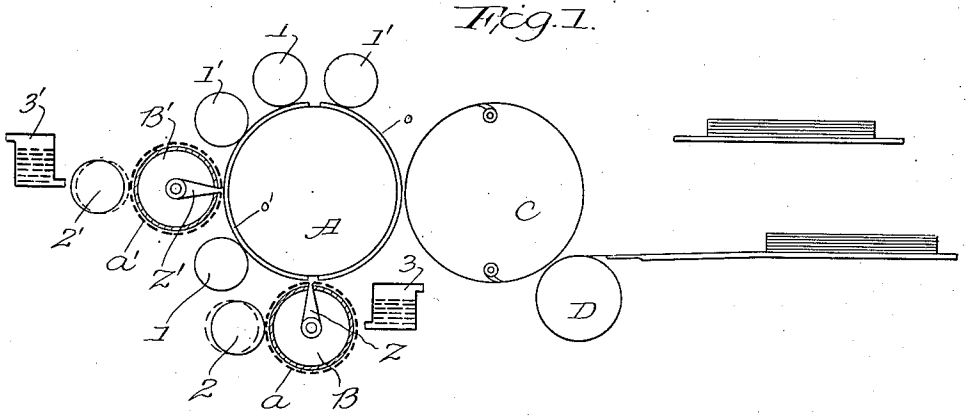


Fig. 2.

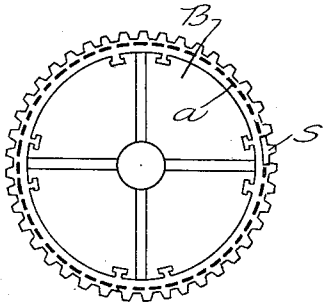


Fig. 3.

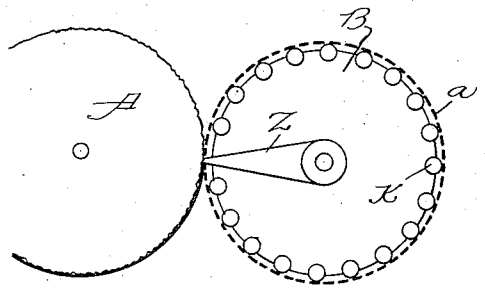


Fig. 4.

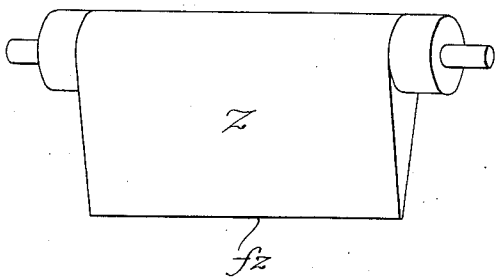
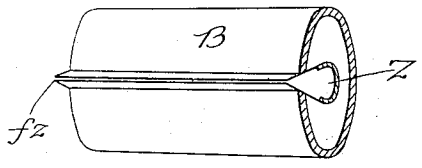


Fig. 5.



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2,132,086

PRINTING APPARATUS

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In Germany December 28, 1935

14 Claims. (Cl. 101—175)

When producing prints of money value, especially bank notes, in copper plate printing or steel plate engraving one will rarely use two colours of the same printing process and at any rate never more than two colours except for Iris copper plate printing; in exceptional cases a second colour serves for printing so-called protection pleins which are solid backgrounds underneath such engravings which contain the most important part of the design, the background being of a different colour from the design. In any case, whenever a second colour in copper plate printing is used, it serves only for delicate line work, the colour-relief of which must not be too much squeezed broad by the subsequent printing operation. Such "two-coloured" copper plate printing is obtained by means of two separate printing forms, a method which however has severe drawbacks, viz. it requires a long time for drying between the two printing operations, it involves differences in register and consequently also waste of paper, and it prejudices the sharpness of the original engraving of the form printed first.

"Multi-colour" copper plate printing in one operation is produced by inking in a printing plate after the iridescent method, i. e. by subdividing the ink trough and filling it with different colours one next the other which when distributed will more or less mix with each other and which are then transmitted to the plate in stripes or streaks. The result is an iridescent play of colours which however is not always of the same uniform effect.

High art prints in two or more colours in copper plate printing and steel engraving are obtained in such a manner that certain parts of the form which form a design by themselves and which are sufficiently distant from each other, are carefully inked in by hand one after the other and then wiped off again.

To compensate for the impossibility of producing copper plate printing in two or more colours in such a manner that the original sharpness of the colour relief is preserved, one uses letterpress or plain printing in combination with one coloured copper plate printing. This too, however, owing to the necessity of damping the paper for copper plate printing, entails considerable difference of colour register and a corresponding amount of waste paper.

Another method of producing multi-colour print by means of a single printing form is to ink in the form with so many form rollers as there are colours in the picture; in this case the composition of the form rollers is so cut out that their surface corresponds with the respective colours. This method serves for printing multi-colour pictures with rough and large colour surfaces one next the other and is chiefly adopted for letterpress printing. For technical reasons, however, this method has never been adapted for multi-colour copper plate printing.

It is also a known method to ink in a printing plate with different colours in such a manner that stencils are successively put on the printing plate, corresponding to those parts of the design which show the respective colour.

This method, however allows no perfect inking in because stencils cannot be pressed so tightly against the printing form as to prevent the colour from getting on the form at the sides of the indentations.

This is not possible with the new invention. It refers to a printing process and means of producing one or multi-colour copper plate printing and steel plate engravings by means of a single printing plate, such prints or engravings containing finest designs, patterns or guilloches, the lines of which cross each other or run one next the other, showing exact register and uninterrupted lines, also showing in all parts the original sharpness of the engraving, such copper plate printing or steel engraving being produced without any wiping operation. The use of only one printing plate for two or more colour copper plate printing is the only means which ensures exact and unaltered original sharpness of the various designs with interwoven and parallel lines.

The essential point of the invention is that for one, two or more colour printing the printing plate, which comprises the whole design or the whole guilloche, is inked in, by and from the inside of a corresponding number of stencil cylinders which, each respectively, comprise the different parts of the design or of the guilloche. The colour plates are produced together with the originals of the printing plate after the guilloche system in one operation. The stencil cylinders may f. i. consist of very thin steel plate or they may be hollow complete cylinders and when being inked in they must fit tightly and exactly to the printing plate; the different parts of the design are mounted, etched and (or) finished by photo-mechanical, chemigraphical or mechanical processes.

The chief advantages of the new process consist—apart from the exact colour register and from the sharpness of the engraving—in the unlimited number of colours, in the saving of ex-

pensive ink and paper owing to misprints, in the simplified and accelerated working if using corresponding devices for letterpress and rotary printing and in the higher safety against errors.

The means which f. i. are involved for rotary printing are based on the principle of a permanent, intense and positively guided development of printing plate and respective colour stencil cylinders. This ensures perfect inking in of all points of the engraving on the printing the line of printing plate cylinder and the stencil colour cylinder. A rotary printing machine for producing one or more coloured copper prints according to the invention is as an example shown on the drawing. The different figures represent:

Fig. 1, a schematic representation of the machine in vertical section,

Fig. 2, an end view of a stencil cylinder,

Fig. 3, a cross section of a stencil cylinder and cooperating parts,

Fig. 4, a perspective of the axle of a stencil cylinder and the cooperating parts which form the ink supplying means and,

Fig. 5, a perspective of a portion of a stencil cylinder and the ink supplying means thereby.

The ink is by uniform pressure pressed from the ink troughs **3** and **3'** through the hollow axle of the stencil cylinders B and B' and through stationary ink feeding chambers *z* and *z'* feeding ink at the line of contact of the stencil with the plate cylinder A, and from here is transferred linewise to the printing plate. In order to prevent the so pressed ink from flowing over laterally on to the inside of the rotating stencil plate or the stencil shell *a* and *a'*, the ink feeding nozzle *fz* is tightened up on both sides and so acts like a doctor. The cylinders B and B' which carry the stencil plates are stationary and carry rotating ring gears which mesh with the ring gears on the plate cylinder A and are taken along by same. The stencil plate or the stencil shell *a* is put underneath or into the movable rims and is therefore positively guided. In order to obtain a good tightening of the stencil plate and to reduce to a minimum the friction of the rotating plate or of the rotating stencil shell *a* lying on top of the stencil cylinders B, the latter may be provided with ball or roller bearings *k* embedded into them. The stencil tightening bar *s* must be on a level with the inside of the stencil plate and when developing on the plate cylinder must engage with the channel for fixing the plate.

2 and **2'** represent wiping devices which remove small colour remnants which may happen to remain on the outside of the stencil plate *a*; **1**, and **1'** are wiping devices which clean the surface of the printing plates **0**, **0'** from possible ink splashes and which in case the sheets contain already the impression of engraved pictures also remove the partial inking in of the surrounding plate surface caused by the indentations of the stencil plate. The action of the wiping devices **2** and **2'** is restrained only to fine wiping and is adjustable in known manner. The plate cylinder A may be of double or quadruple the circumference of the stencil plate *a* and so may take double or quadruple the number of plates. The sheet is fed by the feeding cylinder D to the impression cylinder C and after having received the impression is delivered upwards printed side up. On top of the impression cylinder a letterpress printing device may be provided for.

The device and the arrangement as described above for producing two colour copper printing may be applied also for any desired number of colours or it may also be used only for one colour copper printing.

I claim:

1. A device for producing single and multicolour copper prints—steel-plate engraving—by means of only one printing comprising a plate cylinder carrying a printing plate upon which all parts of the design are inked in through stencil cylinders, the number of which corresponds to the number of colours, and stencil cylinders in rolling contact with the printing plate, each stencil cylinder containing that part of the design which corresponds to the respective colour.

2. A device as in claim 1, in which the stencil cylinder which serves for inking in of the printing plate consists of highly resistant material, on which the respective designs are combined by photomechanical, chemigraphical or mechanical process and the part designs cleared or finished.

3. A device as in claim 1, in which the stencil cylinder which serves for inking in of the printing plate, is a cylindrical shell of highly resistant material, on which the respective designs are combined.

4. A device as in claim 1, having means for inking in the printing plate by distributing the ink on the inside of the stencil cylinder.

5. A device as in claim 1, including stationary cylinders, stencils mounted for rotation about said stationary cylinders, a stationary ink chamber in each of said stationary cylinders with a head fitting tight and doctor-like at both sides at the inside of the stencil plate, and a passage through which ink is supplied under pressure to said ink chamber.

6. A new device as in claim 1, including stationary cylinders with hollow axles, a stencil rotatable about each of said stationary cylinders, a nozzle in each cylinder on the hollow axle thereof, said nozzle being constructed to feed ink at the inner surface of the corresponding stencil cylinder, and means for supplying ink to each of said hollow axles.

7. A device as in claim 1, including stationary cylinders, stencils mounted for rotation about said stationary cylinders, a stationary ink chamber in each of said stationary cylinders, with a head fitting tight and doctor-like at both sides at the inside of the stencil plate, and a passage through which ink is supplied under pressure to said ink chamber including roller bearings on said stationary cylinders for supporting said rotating stencils.

8. An apparatus for producing either single or multicolour undersurface printing by the use of a single printing form upon which all parts of the design are to be inked in, comprising a support for a printing form, a rotary stencil for each colour, said stencils being mounted for rolling contact with said printing form and each bearing the part of the design corresponding to its respective colour, and positive connections between said printing form and said stencils for causing said stencils to rotate in contact with said printing forms during a movement of translation between said stencils and said printing form.

9. A device as in claim 8, in which the stencils are made of highly resistant sheet material.

10. A device as in claim 1, in which each stencil consists of a cylindrical shell of highly resistant material.

11. A device as in claim 8, including inking means arranged to distribute the ink on the inner side of the stencil.

12. A device as in claim 8, including a sta-

tionary cylindrical support for each stencil, said support bearing the stencil as a rotating stencil cylinder, means for causing the stencil cylinders to rotate about their respective supports, a stationary inking device in each such stationary support for supplying ink to its stencil under pressure, and a nozzle on said inking device, fitting tight at each side against its stencil.

13. A device as in claim 8, including a stationary cylindrical support for each stencil, said support bearing the stencil as a rotating stencil cylinder, means for causing the stencil cylinders to rotate about their respective supports, a stationary inking device in each such stationary support for supplying ink to its stencil under pressure, and a nozzle on said inking device fitting tight at each side against its stencil and roller bearings between the said stationary cylindrical supports and said rotating stencil cylinders.

14. A device as in claim 8, including stationary cylindrical supports each bearing means for supporting a stencil for rotation about the said support, spaced ring gears mounted on said supports for rotation about the respective supports, said ring gears being constructed to receive and hold the stencils between them and to drive the stencils positively, and teeth on said printing form support in driving engagement with said ring gears.

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