The Vandyke process

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F R Vandyke is seated on the right in this group photograph of the senior staff of the Photo Litho office of the Survey of India in Calcutta, taken in the early years of the twentieth century.

[photograph reproduced by kind permission of the British Library]

Richard Oliver's article on photo-zincography and helio-zincography refers to the process of 'Vandyking'.[1] At the end of the nineteenth century, the inventor of the process, F R Vandyke had achieved some prominence and the present article provides contemporary descriptions and further explanation.

The following paragraph appeared in the *Royal Engineers Journal* in 1900.[2]

> ***Reproduction of Drawings in Black and White***
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> The Assistant Surveyor-General in charge of the Photographic and Lithographic Office, Survey of India Department, reports that a very simple and cheap method of reproducing drawings in black and white has recently been discovered by an assistant of that office. The advantages of this process are that it entirely does away with the two first stages in the ordinary process

[1] Richard Oliver, 'Photo-zincography and helio-zincography', *Sheetlines* 90, 41.

[2] *The Royal Engineers Journal,* December 1900, 262.

of photo-zincography, the image being obtained upon the zinc surface by direct printing through the original, without the intervention of a negative or transfer. The results obtained are better than those yielded by photo-zincography, as there is no loss of sharpness, while the saving effected, both of time and money, is considerable. Any subject drawn or printed in black on paper or tracing cloth can be dealt with, but the process can, of course, be applied only to drawings intended to be reproduced to the same scale. It is now being utilized for the reproduction of a large number of village maps of Orissa, and 25 plates of the ordinary cadastral size are being prepared daily by its means. It is the invention of Sub-Conductor F R Vandyke, RE, Foreman Litho Printer, who has been granted a patent for it. The Surveyor-General congratulates Mr. Vandyke on his most useful discovery, and on the skill and perseverance with which he has overcome the many difficulties met with in bringing it to a successful issue. Details of the working of the process can be obtained on application to the Assistant Surveyor-General.

In 1913, the Survey of India produced a pamphlet describing the process for use in a Field Reproduction section.[3] I have yet to find a copy of this pamphlet.

During the Second World War, presumably when security restrictions limited what could be published relating to current operations, *The Sapper* published the following short article about the Vandyke process.[4]

For the benefit of those not acquainted with the art of lithography, let me first explain that the trade was invented by Aloys Senefelder in the year 1796 and comes from the Greek words *lithos* – a stone and *graphos* - I write.

The principle of lithography is that water and grease will not combine, and a drawing made with a fatty substance on the surface of a clean stone or zinc plate, adheres to it so strongly as to require a mechanical force to remove it. The parts free from the drawing receive and retain water; therefore a roller covered with fatty ink being applied to the printing surface, when wetted, the fatty ink will attach itself to the fatty drawn parts and be repelled from the wetted parts.

It will be appreciated that to draw a plan in reverse – on a stone or zinc plate is a long, tedious and expensive business, but the Vandyke process, as evolved by ex-Sgt. F R Vandyke, eliminates all drawing when it is desired to reproduce a manuscript or printing plan, at the same scale, provided the existing plan is drawn or printed on paper that will allow the light to penetrate through, and the detail and line work is opaque.

For the Vandyke process a zinc plate is coated with a solution of fish glue, sensitized with dichromate. This solution is soluble in water until it is dried and exposed to light, after exposure it is insoluble in water.

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[3] Survey of India Notes & Instructions No. 3 – Notes on the 'Vandyke' or direct zinc printing process, with details of the apparatus and chemicals required for a small section. Compiled in the Photo and Litho office, Survey of India, Calcutta, 1913.

[4] *The Sapper*, May 1940, reprinted with permission of the editor.

The zinc plate is washed, then clamped to a motor whirler and started in motion. The centre of the plate being the centre of gravity a small amount of the solution poured on to the centre will be evenly distributed over the whole surface of the plate by the motion of the whirler. The plate is then placed on a gas table and dried. The whole of the operation must be carried out in subdued light, to prevent premature exposure of the sensitized solution.

The manuscript plan is then placed on the glass sheet in a large printing frame face upwards , the sensitized plate placed on the plan, the printing frame closed, and perfect contact made between plan and plate by exhausting the air from the frame.

The frame containing the plan and sensitized plate is taken from the subdued light, and the sensitized film now covered by the manuscript plan exposed to the full daylight, in inclement weather the exposure may be made in strong artificial light.

The action of the light where it reaches the sensitized film causes that film to become hard and insoluble in water, but where the light does not penetrate, the film remains soluble in water, hence the reason for the paper bearing the plan to be transparent enough to permit the light to penetrate, and the actual detail of the plan to be sufficiently opaque to exclude all light.

After exposure the frame is taken into subdued light again, water and a solution of aniline dye poured over it. The dye stains the solution on the plate, violet or scarlet being generally used. The plate is then dried over a gas table.

The plate is now taken into full light for inspection, and it is found that where the light has acted on the sensitized solution, the film has become insoluble in water, and is now stained with aniline dye, but where the light could not penetrate through the line work and detail of the original plan, the solution, still being soluble in water was washed away from those parts, having the clean metal exposed, as the aniline dye does not stain the bare metal.

Any defects in the film can also be seen at this stage. They may have been formed by specks of dirt on the manuscript plan, or by dark patches caused by uneven texture of the paper on which the plan was drawn; they appear as clean metallic spots, and no dye will be present on them. The spots are removed by painting them over with a weak solution of gum arabic. The plate is again dried on the gas table.

The next process is to ‘ink up’ the plate, this is done with a fatty mixture made up of re-transfer ink and bitumen solution. The mixture should be about the consistency of cream and applied evenly all over the plate with a roller.

When the ink is dry the plate is immersed in a weak solution of sulphuric acid. The acid disintegrates the film of fish glue which is completely removed by wiping the plate very lightly with a piece of flannel.

The sulphuric acid is diluted to such an extent that it attacks neither the

metal nor the ink, consequently when the plate has been thoroughly washed and dried there remains the detail of the plan in fatty ink on the plate, in reverse, in other words we have arrived at the stage where the plate is passed on to the printer, or where we would be had the plan been drawn direct to the plate by an artist.

The whole Vandyke process occupies a matter of hours, whereas it would take an artist probably weeks or even months to produce.

The above article was illustrated by a photo of a memorial plate to Vandyke, location not known, but presumed to be in the Survey of India Offices in Calcutta.

In Memoriam
Frederick Reginald Vandyke
Born 28 September 1865
Died 24 June 1936
Enlisted in the Corps of Royal Engineers 1885
Joined the Survey of India 1889
Appointed Manager Photo Litho Office 1903
Retired 1923
Served in Mesopotamia during The Great War in 1916.
Awarded the Kaiser-Hind Gold Medal 1st Class
Inventor of the Vandyke Process
Erected by those who served with him
in the Photo-Litho Office, Calcutta
in admiration of his distinguished service

The reference for the following brief note, presumably taken from a military survey manual, has been mislaid.

The Vandyke process is particularly suitable and convenient for work in the Field. The process is a rapid one, and under good conditions it is possible to turn out a plate in an hour or two, though such speed is not desirable except in an emergency. The apparatus is not bulky. It is possible to work without the two biggest items – namely, the whirler and artificial light – in which case the only bulky parts are the two developing baths and the printing frame. A whirler is, however, very desirable, and unless artificial light is available the process cannot be depended on to turn out urgent work with certainty in a northern climate, and with the possibility of night work coming in.

There are certain points which must be recorded as against the many advantages of the process:

(1) For registered work in colour it is necessary that the different drawings should be exactly to size. No small adjustments can be made, as the drawing is in direct contact with the zinc plate. The difficulty is minimised if all the

drawings are made in the same room and the plates are made close at hand and under the same conditions as nearly as possible.

(2) Being a contact process, it does not allow for enlarging or reducing from the original.

(3) The best results are only got from finished drawings in firm black lines, which entails good draughtsmanship. The fineness of the line, however, is immaterial provided that it is thoroughly clean and opaque. If the drawing is poor it is better to photograph it for the Helio process.

The process was taught to trainee cartographers at No. 2 Survey Production Centre RE and the following description is taken from the lecture notes used for many years by Ken Stephens.[5]

The Vandyke process (Glue reversal)

The plate-coating or colloid used in the Vandyke process consists mainly of process glue, ammonium-bichromate and water, as previously mentioned the plate is first made chemically clean by washing in a weak acid solution, washed in running water, coated with the fore-mentioned colloid and finally exposed.

Although development can be accomplished by using a developer of low-water content (as in the Gum reversal process) the normal method of development is to rinse or spray away water under a tap all the soluble glue and assist removal by gently swabbing with cotton wool. The plate is now drained and placed in a dye-bath, the purpose of the dye is to make the developed image more clearly visible, a variety of dyes may be used but the normal process employs a mixture of methyl-violet and industrial spirit.

After dying the plate is washed until all work detail appears as clean metal, great care is taken during this operation since the glue-stencil will have become soft and tender during processing, it is for this reason the plate is dried as rapidly as possible immediately after washing, drying is carried out in the whirler.

The plate is now immersed in a weak acid bath to ensure that all metal appearing in the stencil is fully grease-sensitive, the dye-strength is diminished during this process, the plate is washed and dried once again. A solution of shellac (this contains a fatty base) and industrial spirit is rubbed well into the plate surface and then a greasy ink is applied, polished to dryness and the plate finally dusted.

The removal of the glue-stencil is achieved by immersing the plate in a solution of hydrochloric acid and water (this bath is slightly stronger than that employed to ensure the metal is grease-sensitive) the glue commences to swell and soften and it is then gently scrubbed away. The plate is washed to remove all traces of acid, wiped dry, it is then covered with 'etching solution'.

Although etch makes the plate-surface sensitive to any following solution its purpose may be summarised thus, 'Etch serves the purpose of building up

[5] From Cartography lecture notes used at Survey Production Centre RE by Ken Stephens.

a perfect water-retaining and grease-resisting surface and also reduces the tendency of the plate to oxidise when in contact with water.

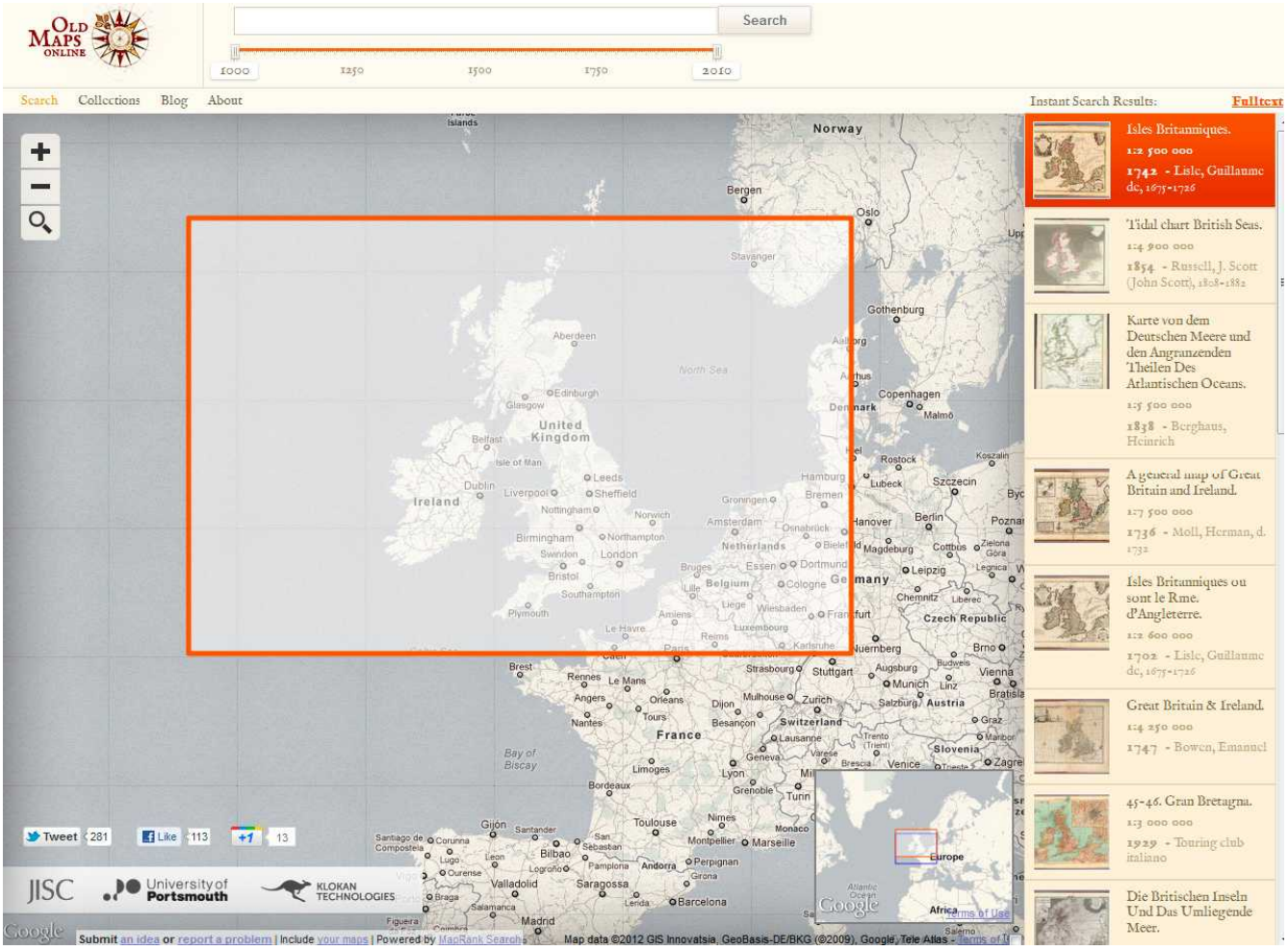
The etch is rinsed away and the plate gummed up in readiness for the printing machine.

The fundamental differences between the Gum reversal and Glue reversal processes are : -

(a) Colloid contains gum as opposed to glue.

(b) Development in the Gum reversal process employs calcium-chloride or glycerine whereas water is used for developing the image in the Glue reversal process.

(c) The plate is dyed after development only in Glue reversal process thereinafter, the processes remain the same.



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