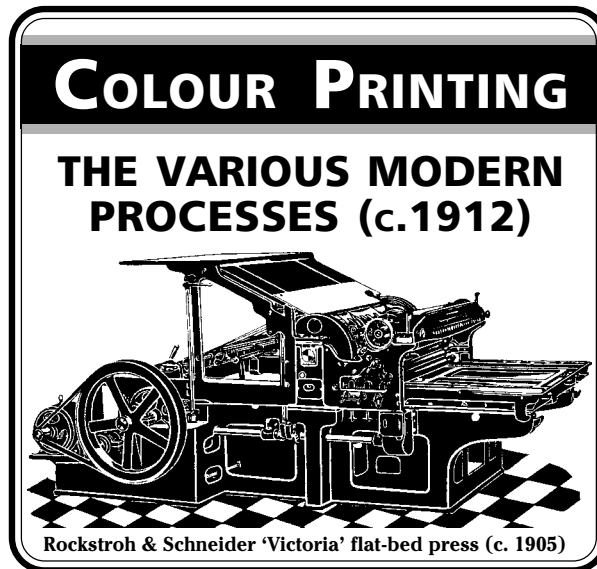


Many readers have asked for technical details on printing processes and terms mentioned in TPA. I always hesitated to answer these requests within the pages of this magazine, as my command of English is too limited for detailed (technical) explanations.

Now I think I have found a good solution for this "problem". An old article which not only explains all "modern printing processes" used before 1912, but which provides also some interesting historical information and, of course the personal/actual opinions and trends of the (British) authors of that time.

Letters received in the meantime referring to Colour Printing part 1 in last TPA issue, prove that I am on the right way.



Harry Potterton kindly supplied a original copy of "THE TIMES" (No. 40,000 - Printing Number) from Tuesday, Sept. 10, 1912.

I am going to reprint most of this comprehensive article. Unfortunately the names of the authors are not mentioned. Some (company/artist/publication) names the writers refer to are unknown to me. But I strongly believe that this article will answer many questions, puts some light on the economic/technical situation in the (art) printing business of that time and has also some entertaining aspects (from today's view).

For illustration I have chosen some cards / printing trade adverts from my collection.

Con't from TPA 14: - PART 2 -

PHOTO-ENGRAVING

- THE HALF-TONE PROCESS.

The technical term "half-tone" came into being to describe and differentiate a new process from one already existing called the "line" zincograph process. Several houses had in the 'eighties established flourishing concerns for turning pen and ink drawings into printing blocks. It was not long before this class of "etching", as it was called, attained to practical perfection. There was, however, more to accomplish; a photograph or picture was not composed of lines, and therefore found no method of reproducing itself for letterpress other than by wood engraving. The earliest attempts to produce the half-tones of the photograph were made by means of a granular surface, but were never really successful. It was not until a single-line ruled screen was interposed between the sensitive film and the lens that the surface was broken up in such way as to become printable by letterpress. This was first done in England by the *Meisenbach Company*, a firm which adopted methods invented by a German of that name. In the early days of half-tone process, wet collodion plates were exclusively employed, and by some operators the screen was turned round during the exposure so as to give a double ruling. The negative, once made, had to be printed on zinc, which after polishing was variously coated, the earlier method being the bichromatized albumen used in the line process. It was found, however, that the lines were so fine that they did not "develop out" so well as desired; moreover, the "resist" was scarcely tough enough when the plate was immersed in a nitric-acid bath. This led to a new and greatly improved sensitive solution of bitumen dissolved in benzole. The invention of the cross-line screen led to great improvements in negative making, and for a time the bitumen process produced quite creditable results.

PROCEDURE.

The procedure was briefly as follows: - A plate of zinc was coated with bitumen, which soon became dry and hard. The plate was exposed under a half-tone negative in a strong

printing frame. One of the pioneer half-tone firms stripped their negatives with india-rubber films, laying them direct on to large zinc plates without the use of frames. After an hour or two's exposure to a good light (sun or electric) these plates were developed in turpentine, which removed all the parts that had been protected by the opaque parts of the negative. The rest, having become insoluble, remained firm. A water douche was used to remove all traces of grease left by the developer, and the plate was ready for a first bath without inking. In the further stage of etching the plate was protected by rolling up with lithographic ink, just in the manner of stone work. This done, there was the all-important process of "fine-etching" to be undertaken. A proof was pulled which revealed the picture covered with a flattening tint of minute square dots. The fine etcher then often had to expend great efforts in protecting certain parts with lac varnish while subjecting the plate to successive baths, until the lightest part was covered with minutest dots.

In general principles nothing has changed from the early methods, but in the detailed and separate processes such great strides have been made that block making is now a simple and easy matter. Before we describe the modifications that have been reached today we must remark that some of the German and Austrian houses so perfected the

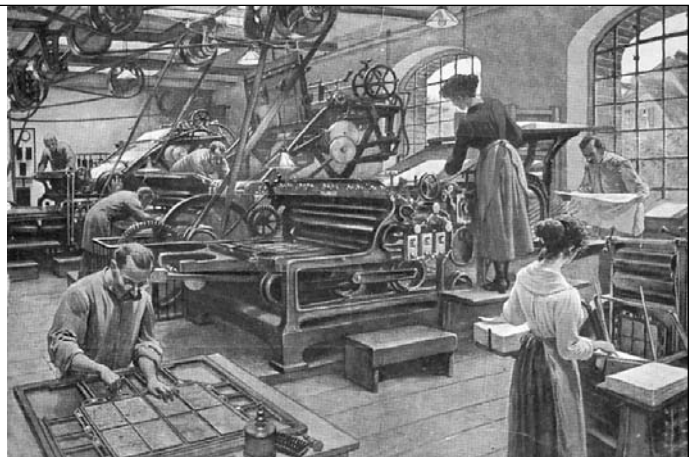
method of printing from a negative on to transfer paper that they were able to lay down to zinc remarkably fine impressions instead of exposing the plates to light. Without doubt the Levy screen is responsible for the great advance in half-tone.

SCREENS.

The screen gratings are made in various widths of line to suit the particular purpose for which illustrations are desired, the rulings vary from 50 lines to the inch to 250. The coarser screens are useful for large or poster work, but for the general book and picture illustrations the texture is 150 to 175 lines to the inch. The coarser the screen the greater the force or contrast, and the finer the screen the softer the graduations and the greater the detail. The manufacture of the ruled screens or gratings for process engraving is an operation necessitating extreme care, and on the degree of accuracy much depends. Great credit is due to *Mr. Max Levy*, of Philadelphia, for first perfecting a method of preparing these screens, and, although he has had several able competitors both here and on the Continent, his work still holds its own.

The making of screen rulings for process engraving is, as has been remarked, a difficult operation, and may be briefly described. A sheet of the finest plate glass is coated with a composition of asphalt and wax and placed

Meinholds Handwerkerbild Nr. 14. shows "Buchdrucker" (letterpress printer / personnel) at work, with all their typical tools and machinery. Original painting sized 65 x 91 cm. For more info on the printer/publ. *C.C. Meinhold & Söhne*, Dresden, see TPA 12, p15.



in a machine for ruling; the cutting point is a diamond cut to the width of the required line; the machine is driven by a small motor and automatically rules the lines diagonally from edge to edge of the plate; the rulings are represented by clear lines cut through the asphalt coating, with the alternative spaces of dark and cut lines as near as possible equal. This ruled plate is then subjected to the vapour of hydrofluoric acid, which etches or eats into the glass where the diamond has cleared the protecting surface of asphalt; the plate is then cleared of its coating and the etched lines are filled in with a black pigment which gives solid permanent black lines alternating with clear glass spaces. Two of these screens cemented together face to face form a grating of lines crossing each other at right angles with square spaces of clear glass; the image from the lens is projected through these spaces on to the sensitive plate and thus breaks up the continuous tones into dots. On examining the negative with a magnifying glass, it will be observed that the groups of dots join each other in the high lights, the shadow portions are finely separated small points, whilst the varying tones of the picture are interpreted into graduations of dots, smaller or larger as the subject demands.

SOLUTIONS USED.

Next in importance is the change in the sensitive solution employed. Albumen, bitumen, and transfer all gave way before bi-chromatized albumen fish-glue, which is now universal. The fishglue solution in itself is not an acid resist; less so than albumen rolled with ink and much less so than bitumen; but its chief merit is that it can be made very tough by "burning in" over a flame. It was soon found that this heating process degraded the printing zinc plate hitherto employed, so that copper was used instead. Consequently, an appropriate etching bath had to be employed, and this was the perchloride of iron familiar to the original "etcher", whose title had been adopted by the photo-mechanical engraver. Thus we have seen changes in every stage of the process so important that practical perfection has now been reached.

It is worth while, however, to explain the most significant scientific phenomenon that makes the half-tone process possible and it is indeed probable that many workers are unfamiliar with the optical principles that facilitate their industry. It may not have occurred to our readers that if a ruled screen were placed in perfect contact with a sensitive plate (and this could only be done with a dry plate) the negative would contain crossed

The message imprinted on this postally unused card reads:

"Messrs. Willson, the Colour Printers of Leicester and Nottingham, have had a very busy season, and the hoardings throughout the Country bear excellent specimens of their work. The type and general "get-up" is in appearance exceptionally clean and attractive, whilst the colours employed are both vivid and diversified. — THE ENTR'ACTE, Jan 10th, 1904.

Messrs. Willson should have taken more care of their own advertising card (printing) quality which not very exciting.



Messrs. Willson, Nottingham, have had a very busy season throughout the Country. The type and general appearance is exceptionally clean and attractive, whilst the colours employed are both vivid and diversified.

white lines equal in width to the black lines of the screen — and very little else. Inasmuch as the screen consists of spaces of one-two-hundredth part of an square inch, the light rays have to pass through them to the negative. In doing so they are diffracted in such a way as to form from each square space a divergent cone of light. From a white surface on the original the divergence of rays is at its maximum, from a darker part less, and from the darkest part at its minimum. To put the matter vividly, there are in any given square inch as many as ten thousand cones of light, some of which meet each other on the sensitive film, and some which do not. This is the phenomenon which makes "half-tones", broken up into dots of unequal size, and gives us the plate we so much admire. The operator has to determine the distance which shall separate the plate from the screen and utilize the diffraction.

The process described is the basis of all photo-mechanical colour letterpress printing explained in our other technical articles.

THE THREE-COLOUR PROCESS.

— HISTORY AND DESCRIPTION

Upon the theory that all the colours of nature are explained by the phenomena of the solar spectrum, the great Clerk Maxwell demonstrated in 1861 that the three spectrum colours, red, green, and violet, were the primary or foundation colours and that all other colours were secondary. He further showed that these three colours produced not only black and white, but all the intermediate colours of the spectrum as well. The establishment of this principle had the effect of directing the attention of a large number of scientific men in this country and abroad to the working out of its practical application to the production of pictures in colour by means of photography. The services of the chemist and optician were requisitioned and their combined researches ultimately resulted in the three-colour process of picture making. In the course of these researches a very large number of processes were evolved, many of them exceedingly clever, but it cannot truly be claimed that any one of the in-

vestigators devised the complete process as it now stands. It has, as in the case of most discoveries, been evolved from the most practical elements of a mass of processes and inventions.

The term "three-colour-process" is now technically applied to the method of photo-mechanical engraving of surface printing blocks for the reproduction of pictures in colour in the printing press, and although the method has only been in practical use for a relatively short period (less than 20 years) it is by far the most important development in photo-mechanical illustration since the introduction of the half-tone process block for monochrome pictures.

EARLY EXPERIMENTS.

The history and evolution of three-colour photography is almost a romance, and is quite a fascinating study. It is curious to observe how prophetic were the conclusions arrived at by some of the early workers, wanting in only one or two comparatively unimportant details to make the process as complete as it is today. As early as 1865, only four years after Clerk Maxwell's theory of the colours of the spectrum was announced, two investigators — Ransonnet, of Vienna, and Collen, of London — simultaneously suggested the use of three negatives, photographed through red, yellow and blue glasses, and the printing of the results in the same coloured inks on paper. This proposal practically embodied the whole principle of the three-colour process as put into practice a quarter of a century later and as worked at the present time, but, unfortunately for these gentlemen and for many other investigators after them, there were no photographic plates in existence in those days which were sensitive to all the filtered rays of light; as a matter of fact, it was then and for many years afterwards scarcely possible to obtain an image on the negative when the photograph was attempted through the red or even with the yellow filter. The use of these filters is explained further on.

Professor Vogel, of Berlin, discovered that the addition of certain dyes to collodion — as, for instance, eosine — had the effect of rendering sensitized salts of silver more sensitive to a wider range of spectrum colours. In 1867-9 two French investigators, Cros and Ducos du Hauron, made use of Vogel's invention of colour sensitive plates and produced nega-



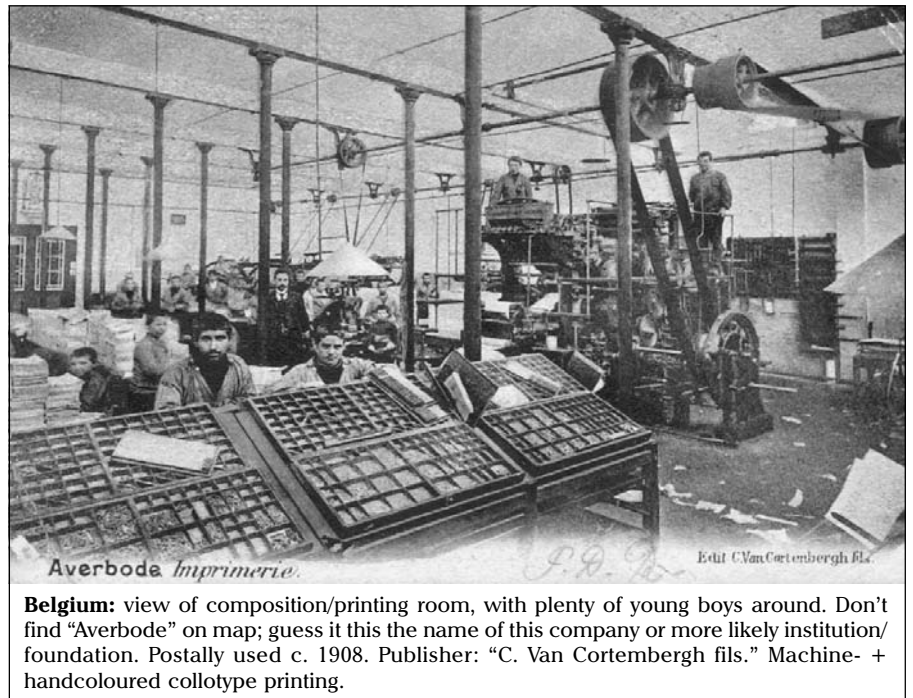
(con't) tives which were excellent in their qualities of analysing colour values, but the printed results were unsatisfactory owing to the fact that the discoverers did not realize that for printing inks they should not use the same colour as employed for their light filters, but the complementary colour – that is to say, the negative made through the red screen should not be printed in red ink, but the complementary colour, green or blue, and, for the same reason, red printing ink for the image produced through the green screen and yellow ink for the blue screen negative should be used.

During the period between 1869 and 1888 many earnest workers were engaged in researches, and invention after invention was published by *Dr. E. Vogel* (the son of the professor of that name), *Dr. E. Albert*, of Munich, *Professor Ives*, of Philadelphia, *Kurtz*, of New York, and many others, both in England and abroad; but it was not until the early nineties that the three-colour process was established as a practical process and industry.

COLOUR BLOCKS AND COLLOTYPE.

In England during this period the researches into photographic science were most carefully followed and elaborated, and as a result important improvements in working were demonstrated and published. In 1890 *Mr. F. Bligh Bond*, of Bristol, using specially sensitized dry plates, produced a set of three-colour negatives of a still life subject which were printed in colours by the colotype process, under the direction of the writer, by Messrs. *Waterlow and Sons (Limited)*; the results were published in the *PHOTOGRAPHIC QUARTERLY* of July, 1890, accompanied by a comprehensive article. The firm of Messrs. *Waterlow*, above mentioned, were amongst the first of great English printing houses to take up and develop three-colour reproductions by photography, and extensive experiments were conducted by them, under the writer's superintendence, during the years 1884-95.

Following the successful reproduction of three-colour results by the colotype process the next step was the preparation of photoetched blocks in colour for the printing press, and some of the earliest plates by this method were issued as supplements to *LAND AND WATER* in 1891. The editor of that journal, *Mr. G. Teesdale Buckle*, was most enterprising, and much credit is due to him for his faith in the future of the art. The present writer contributed an article to the *ARTS REVIEW* in 1892 on the then new process and illustrated it with a plate printed from three-colour blocks from a painting by *Da Costa*. *Mr. Martin Cohn* established an engraving house in London in the early nineties for three-colour block reproductions and produced some excellent plates for both artistic and commercial illustration; his process, which he called "Heliochrome", was afterwards taken over by Messrs. *Waterlow and Sons*, and is still worked by them. Amongst other pioneer firms who formed installations for three-colour reproduction were *The Hentschel Colortype Company (Limited)*, Messrs. *John Swain and Sons (Limited)*, *Mr. George W. Jones*, Messrs. *Andre and Sleight (Limited)*, Messrs. *Cassell and Co. (Limited)*, *The Strand Engraving Company (Limited)*, and the *Arthur*



Belgium: view of composition/printing room, with plenty of young boys around. Don't find "Averbode" on map; guess it this the name of this company or more likely institution/foundation. Postally used c. 1908. Publisher: "C. Van Cortembergh fils." Machine- + handcoloured colotype printing.

Cox Illustrating Company; *Mr. E. Sanger Shepherd* was also an indefatigable worker in colour photography, and contributed much to the early success of the process.

From 1892 onwards the three-colour process has progressed with astonishing rapidity, and at the present time every important photoengraving establishment has an installation for colour engraving, and it may be said that every printing office has provided special plant for producing the printed copies.

LIGHT FILTERS.

In describing the working of the three-colour process as generally adopted at the present time, it is necessary to explain that all sensations of colour are the result of the absorption and reflection of the rays of light which fall upon the surface of the object; it is only the rays which are reflected which produce the sense of colour to the eye – thus, should the surface absorb all the rays, it will appear black; should it, on the contrary, reflect all the rays it will be white, whilst between these extremes there remains every tone and shade of colour represented in the spectrum.

Light filters have been devised which permit the passage of certain colours and refuse that of others – e.g., a light filter of orange red will take up all the reds and yellows in the subject and re-fuse passage to the complementary colours blue, violet, and green – that is to say, the reds and yellows of the object will impress themselves to the photographic plates as relative whites, and only the blues, violets, and greens will appear on the negative as dark tones; in this manner the colour photographer

is enabled to analyse out the colours of any subject into three separate categories representing approximately the three primary colours, and when the impressions from these negatives are etched on metal for the printing press the result of the three superimposed printings in yellow, red, and blue pigments represent the colours of the original in all its grades.

APPARATUS

The screen has been described in an earlier article. The lenses, cameras, and apparatus utilized for the three-colour process must be of the highest quality, the electric arc lighting must be of the most efficient kind, and complete studio and laboratory arrangements provided for the treatment and development of the colour negatives. Extreme accuracy is demanded in each operation, and absolute register for all three negatives is a necessity, any defect in balance or colour or register being fatal to first quality results.

Electric arc lamps of great intensity are usually provided for illuminating the object or picture to be reproduced, otherwise prolonged exposures are necessary and the colour values are not rendered accurately; but all objects or paintings cannot be satisfactorily lighted by artificial means, and both day-

light and direct sunlight are used. In the process studio both kinds of lighting are arranged for, as well as open or cut-of-door studios on a revolving base to permit of sunlight exposures.

The dark rooms are fitted with special lamps for developing colour sensitive plates: deep red for plates sensitive to blue and yellow and deep green for red sensitive negatives.

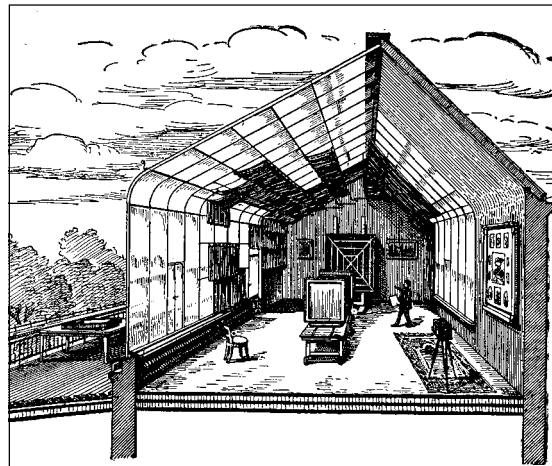
Lenses and prisms are manufactured specially for photo-engraving purposes, and most of them are excellent for colour work. It is necessary for the lens to have great illuminating power with medium-sized stop and for the focus to be somewhat longer than the largest angle of the plate to be covered – say, 18in. focus for a 15in. by 12in. plate. The prism, for reversing the image in the camera, should be most accurately surfaced and be of clear glass to prevent loss of light.

SCREEN ANGLES.

The camera must be sound in structure, mathematically square, and be fitted with an arrangement for carrying a revolving circular screen grating for breaking up the image into dots. The screen is mounted in a metal frame on rollers, and is marked off to the correct angles required for three or four colour negative making. In some cases two separate screen ratings are used – (a) one cross-ruled at 45deg. from the vertical, and another (b) cross-ruled at 75deg. and 15deg. from the vertical. The latter is used twice, once from each side, thus giving together 75deg. and 15deg. angles. These screen angles are very important, as any variation from the 75deg., 45deg., and 15deg. angles is liable to cause a disagreeable moiré pattern when the three impressions are superimposed.

Colour filters, for screening or analysing the three colours of an object placed before the camera, are made of coloured films, glasses, or glass cells containing dye solutions. It is important that these glasses or cells should be optically flat, as the slightest variation would cause deflection of the rays from the lens and a consequent loss of register in the finished result. Trustworthy light filters are now supplied by the optician, and it is no longer necessary for the colour photographer to go through the uncertain process of making his own. The colours of the filter are tested by the spectroscope and give standardized results on the specially sensitized dry plates used. The general effect of the colour screens is that the negative made with the orange-red filter is used for the blue printing plate; that made with the green-blue filter is used for the red printing plate; and that made with the blue-violet filter is used for the yellow printing plate.

The photographic plates are specially made for the three-colour reproductions and are sensitized so as to render the most efficient colour values for each particular filter. Collodion emulsion is also employed extensively for colour work and gives excellent results. Dry plates, however, are less complicated and are more rapid, and they are consequently generally adopted. The plates known as ortho-chromatic are sensitized for the reds and greens of the spectrum, whilst the panchromatic plates are sensitive to nearly the whole range of colours.



The firm of C. H. Ulrich, Charlottenburg (Berlin) offered photographic studios and all other darkroom equipment to the printing trade, also abroad. This advert was used in 1904.

C. H. Ulrich

Charlottenburg IV
Bismarckstraße No. 98

baut an allen Plätzen des In- und Auslandes

**Reproduktionsateliers und
photogr. Drehscheiben**

mit besten Lichtverhältnissen, garantiert regen- und schweißwallerdichter, in einfacher und in Doppelpanzerergläufung.

Auch Laboratorien-Einrichtungen, Steingutbecken, Fenster-Verdunkelungen, Dunkelkammerfenster, Beleuchtungsgardinen usw.

Über 200 Seiten stark, reichillustrierter
Katalog gegen 2 Mark.

PREPARATION OF THE NEGATIVE.

The preparation of the negative is the most important factor in three-colour block-making; any defect in the operations may cause failure in the ultimate result, and in any case considerable trouble in etching and re-etching the plate, coupled with expensive revisions and re-proofing; every care is therefore necessary, and great judgment must be exercised by the operator. The lighting of the subject is the first care, then the selection of the proper light filter, setting the ruled screen angle and distance from the plate, the selection of the correct kind of sensitive plate, and lastly, the exposure and development. These operations are, of course, repeated for each of the three negatives.

After the photo-etcher has completed the three plates they are trimmed, squared up, and mounted on wood, type high, and sent into the pressroom for proofing. The yellow printing block is taken first and placed in the machine, a standard yellow ink is used, and proofs are pulled, which are allowed to dry, preferably for some hours, before the next colour, the red, is printed. The red printing is carefully registered, so that it falls exactly over the previous yellow impression, and this printing is also allowed to dry before the blue or last printing is taken, with the same precautions as to the standard, quality, and weight of ink, and exact registration or fitting.

Provided all the operations previously described have been correctly carried through,

the results of the above three printings is a complete picture, carrying every colour and every combination of colour represented in the original, no matter whether the subject is a painting, a tapestry, a porcelain vase, a flower, a view direct from nature, or a group of objects for a commercial illustration. But great as are the present uses of three and four colour plates and printing, it is safe to predict that we are only on the threshold of its future development for the purposes of the illustration of all that is beautiful in art and useful to mankind in science and commerce.

THREE AND FOUR COLOUR PROCESS.

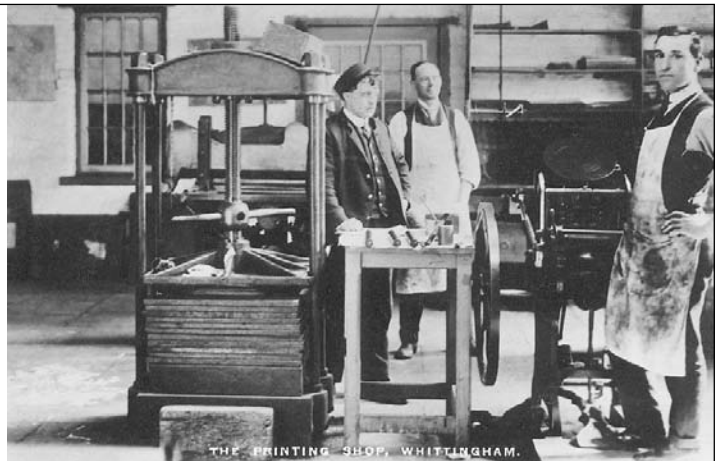
PRINTING METHODS.

In three and four colour process the preparation of the forme is similar to that for ordinary letterpress printing. The blocks are either imposed in a chase or mounted on shutters, or specially prepared steel beds, with movable catches, as preferred. When imposed in a chase the blocks should be so arranged as to be easily moved to facilitate "register".

The forme or shutter containing the yellow blocks is placed in the machine in the same manner as an ordinary block or type forme. The blocks are then levelled, the cylinder prepared, overlays put up and generally "made ready" in the usual way. Care must be taken, however, to dress the cylinder with hard

**The Printing shop,
Whittingham** -
publ. by "Evans"
from Preston.

Tiny foot-driven printing press and spindle-press seen. Maybe a museum printing shop? No idea. Would appreciate readers help with this one. Nice view anyway. Real photo card, not p/u, printed in Britain. From the 1920's? Later?



packing, finishing up with a stout sheet or manila; there must be no "play" or "sag" anywhere. Every part of the machine must be absolutely rigid to ensure perfect register.

In making-ready the yellow forme it is preferable to use black ink so that all the details of the picture can be readily seen. The make-ready being finished, the yellow ink is put on and the progressive proofs matched for both shade and quality of colour. These progressive proofs are supplied by the process engravers with the colour blocks. Only the most experienced men can work without these progressive proofs. In three-colour work they are made up of a proof of the yellow block in black ink and yellow ink; of the red block in red ink; of the yellow and red together; of the blue block in blue ink; and, last of all, of the yellow, red, and blue together. In four-colour work there is an additional colour, usually black or a broken black. This is printed between the yellow and red as rule, but may in some instances be printed first, or after the red or blue. Having matched the progressive proofs the yellow printing may be proceeded with. The yellow, being printed on the bare stock, is more largely absorbed into the paper than the other colours. It is therefore advisable to print the colour on the full side to form a foundation for the proceeding colours. It is the yellow that puts the light and life into the picture.

REGISTRATION.

When all the paper – which ought to be thoroughly seasoned before using – has been printed the yellow blocks are replaced by the red. These are "made-ready" in a similar way to the yellow, with the addition that they must be made to "register" – that is, to fit exactly on to the yellow print. The colour of red in the progressive proofs must be matched, first by a print on a plain white sheet of paper showing the red only, and then by a print of the red on the yellow already printed, showing the red and yellow in combination. When the progressive proofs are satisfactorily matched printing can be proceeded with. The red gives colour and warmth to the picture, and great care must be taken when printing to preserve a uniform colour, as too much or too little will prove disastrous.

When the red is finished, the blue blocks are inserted and the same procedure takes place as in the previous colours. The blue gives shadow and depth to the picture and imparts complete form and outline. In printing this colour it is more important than ever to keep perfect register. Steady running and a uniform speed throughout are essential to successful three and four colour work.

In colour printing it is important to have a large stock of shallow trays to take the sheets as printed. On most colour work it is also necessary to interleave the sheets when being printed to prevent them setting-off. These interleaves should be well-seasoned paper of fairly good substance to aid quickness in handling. Care must be taken not to place work on trays, even when in interleaves, in heavy quantities, owing to the liability in the case of those carrying a large amount of colour to adhere to the interleaves.

PRESSES

Having described the method employed in printing three and four colour work, we now turn to the machines or presses used. The large production of high class black and white illustrated printing in the United States early led the machine manufacturers of that country to improve the construction of their presses, and to adapt them to the fresh conditions and requirements necessitated by doing away with the "soft packing" method of making ready, which is no longer sufficient for the new conditions. The vast production of elegant and expensive catalogues and books printed from wood engravings, and subsequently from halftone process blocks, often extensively hand-engraved, called for machines of greater rolling power and rigidity of impression. Whilst British printing machine manufacturers were mainly content to rely on the "Wharfedale" stop-cylinder pattern machine to meet all the requirements of the home printer, the Americans were vying with one another in the production of a press embodying all the points demanded for a new class of illustration, on a paper different in texture and hardness of finish from that previously in general use.

The results was the subsequent introduction into this country of the MIEHLE two-revolu-

tion press, then exclusively built in Chicago, and now for some years built by Linotype and Machinery (Limited) at their works at Broadheath, near Manchester. Other American and German built presses, specially adapted for high-class printing at fast speed, have found their way into this country in small numbers. The MIEHLE press is now nearly as popular in this country for the printing of three and four colour process work as it is in the United States, where its manufacturers turn out nearly 100 presses per week. Its introduction and popular acceptance by printers in this country have stimulated the British printing machine manufacturers as no home demand seemed to have done; with the result that British-built presses similar in construction, as well as others differing in design, such as the "SUMMIT" machine manufactured by Messrs. Dawson and Sons, of Otley, and the FURNIVAL two-revolution press, are, among others of British manufacture, being more or less extensively used for printing works of this character.

In the production of good three and four colour printing excellence in every department is necessary, and the machine must fulfil all requirements and demands made on it. With great strength – especially where necessary to give solidity of impression – must be combined perfect ink distribution and rolling power. Absolute smoothness of running at considerable speed is also essential, as vibration is fatal to the usefulness of a press where perfect deadness of register is required. It is very important that the bed or "coffin" of the press should be conveniently situated. The machineman is thus able not only to prepare his forme readily and to attend to it during the process of making ready for printing, but also to give the immediate attention to it which may be necessitated by one or other of the many causes which affect the perfect registering of process colour blocks, which have to depend upon themselves for both colour and form, and derive no assistance from a key giving shape to the picture. In some other methods of colour printing the "key" may be relied on in covering up slight irregularities of register. —

(con't next issue with: *speed and output, pressrooms, coloured inks, chromo-litho etc.*)

Tried to find a illustration of the mentioned two-revolution Miehle press for many days – without success. Below one of the many adverts I found in "Der Deutsche Buch- u. Steindrucker". This dates from Oct. 1908 and has a nice English title. Arthur Pick, Berlin, was the representative for Miehle Co. in Germany.

Miehle Makes Money
Die "Miehle" bringt am meisten Geld ein!

Höchstes Lob aller Kunden, welche übereinstimmend anerkennen, in ihren Betrieben keine gleichwertigen Maschinen zu haben. Seit 20 Jahren als einzige Spezialität gebaut. Mehr als 5200 Stück sind in der Welt verbreitet. Bestes Material! Raschestes und verlässlichstes Funktionieren! Längste Lebensdauer! Größte Schonung von Schriften und Platten! Lohnendste Ausnützung für große oder kleine Auflagen, sowie für sämtliche im Buchdruck vorkommenden Arbeiten!

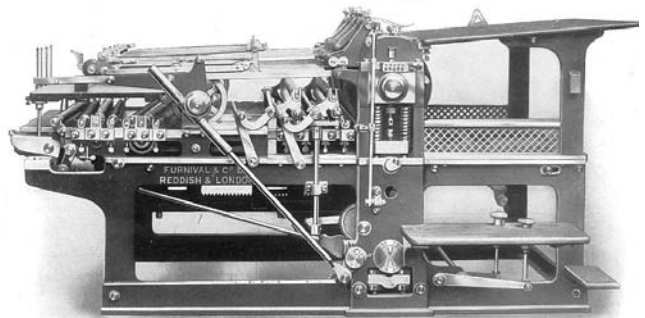
Somit billigste Maschine!

The Miehle Printing Press and Mfg. Co., Chicago-New York
Arthur Pick, Berlin, Friedrichstraße 16.

The "FURNIVAL" two-revolution press, advert from the British "Penrose Annual" (1912). Furnival & Co., Reddish, Stockport, London and Glasgow.

Two-Revolution Printing Machine

Twelve of these Machines used in the production of the "Process Year Book."



Makers: FURNIVAL & CO. Ltd., Reddish, Stockport. Also at 102/108, Clerkenwell Road, London, E.C.1; and 215, Bathwell Street, Glasgow.
Agents for Australasia: F. T. WIMBLE & CO., Ltd., 87, Clarence Street, Sydney, N.S.W. 1 and 394/396, Post Office Place, Melbourne.