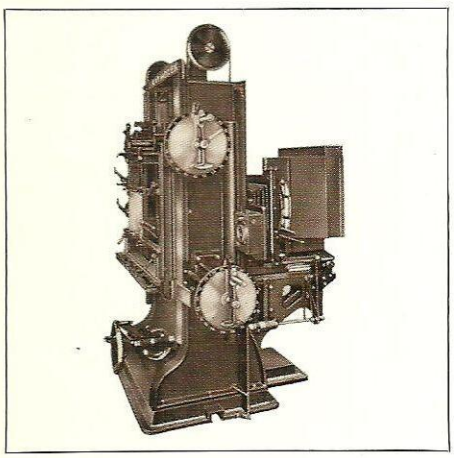
The Monotype Recorder

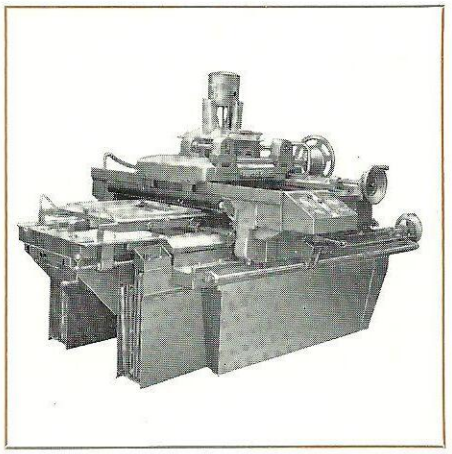
Volume 43 Number 4 Autumn 1969

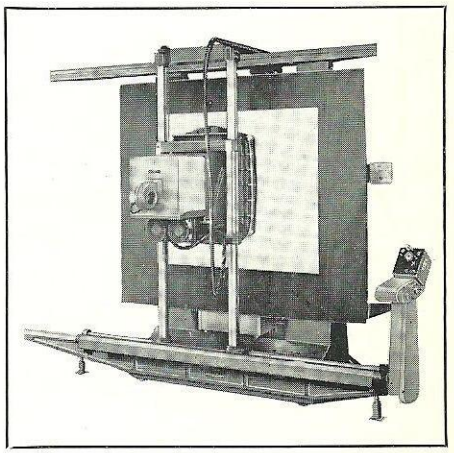
The Innovators

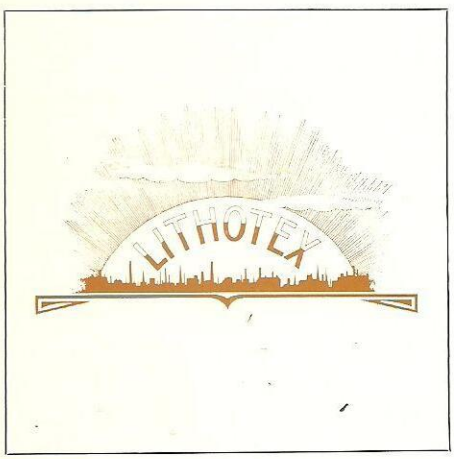
A review of the progress of
Pictorial Machinery Limited

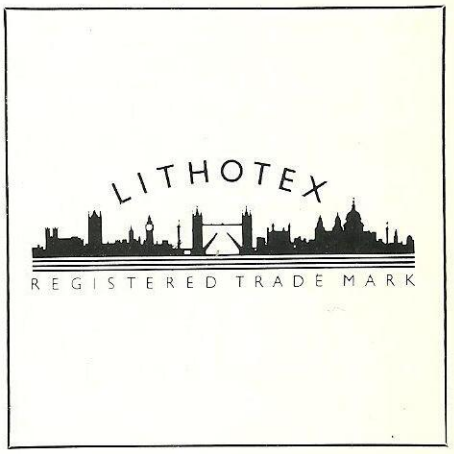
1919-1969

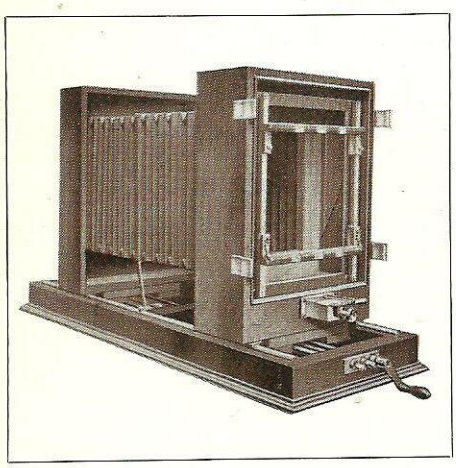


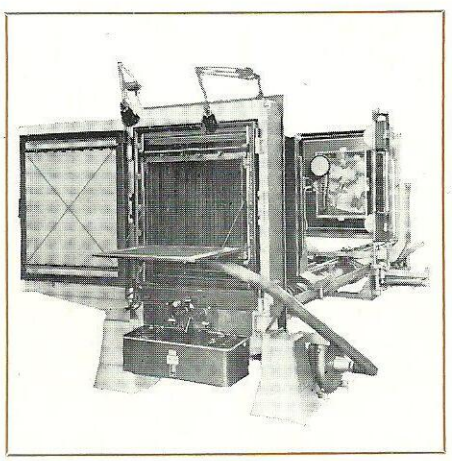


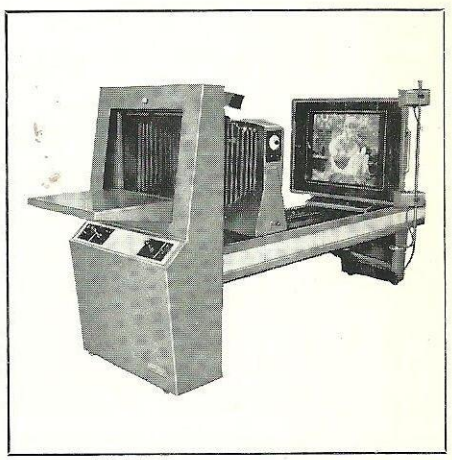












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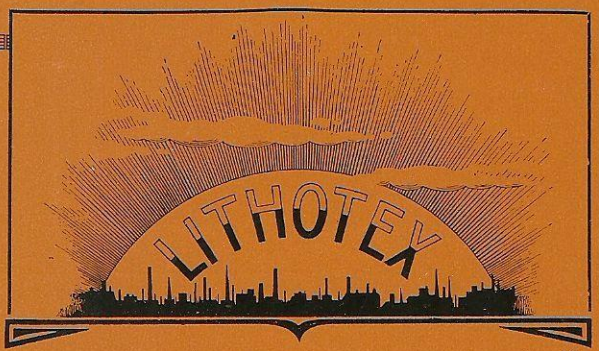

THE illustration represents the Lithotex Sun. Its rays are not only illuminating the roofs of the Factories of Great Britain but are also evoking the enthusiasm of all Lithotex users. One Establishment that has six acres of Printing Machinery relies on the Lithotex Process not only for its deeply-etched Typographic Blocks, but for its Lithographic printing surfaces also. The Manager of this Factory writes as follows: "It would be absurd to go back to older methods." A large Printing Establishment in the United States with 1,000 hands, uses the Lithotex Process for the printing of labels of all sorts, bottle tops, cheques, cartons, etc.

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Frederic T. Corkett, F.R.P.S., *Managing Director.* *Telegraphic Address:* "Pictograph, London."

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"PICTOGRAPH" Cameras, Arc Lights, Printing Frames, Chemicals and Sundries are without doubt the best possible and leave the worker no opportunity of complaint or excuse.

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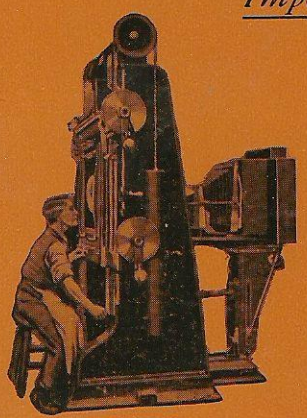

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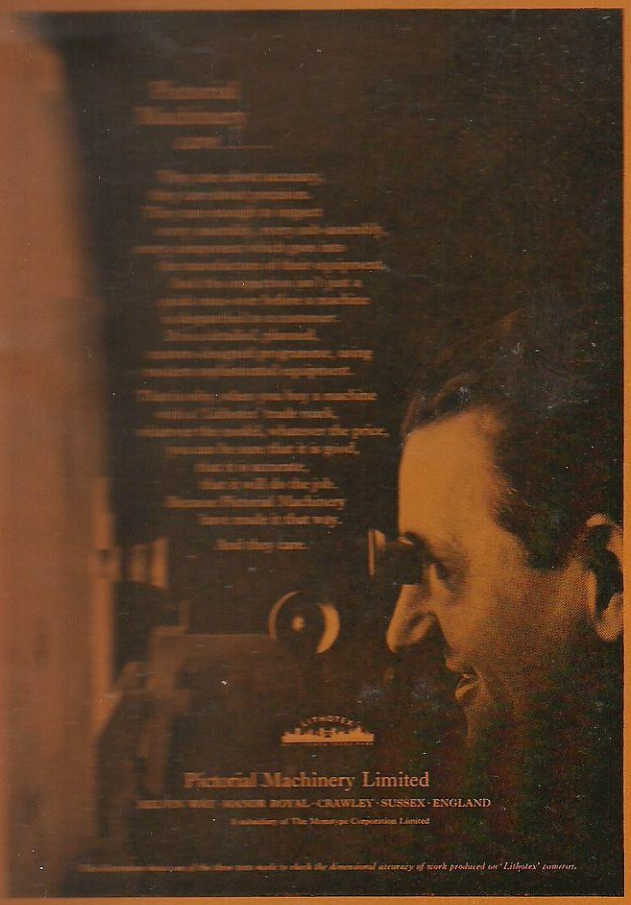

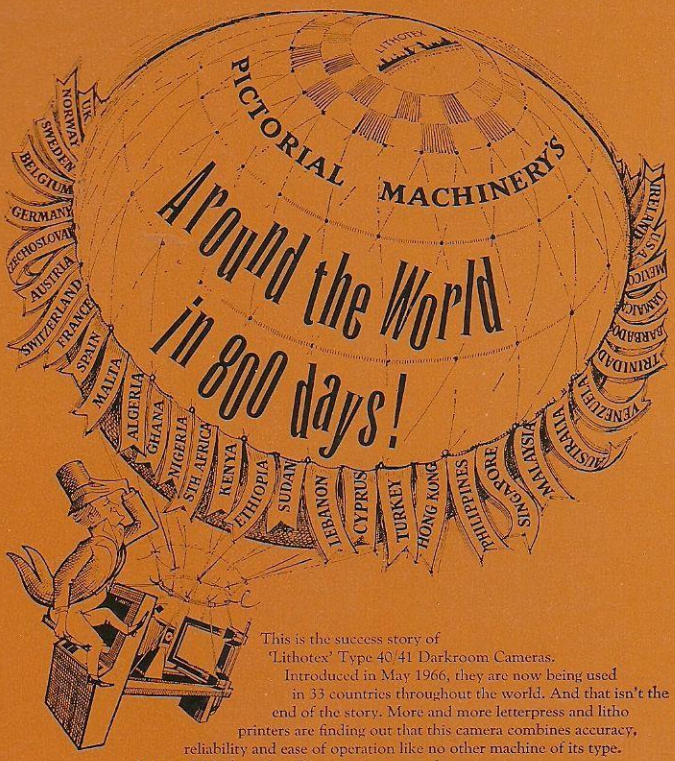

This is the success story of 'Lithotex' Type 40/41 Darkroom Cameras.
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FIND OUT ABOUT TYPE 42 CAMERAS

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Please send me, without obligation:
☐ A copy of the Type 42 booklet
☐ Details of the demonstration

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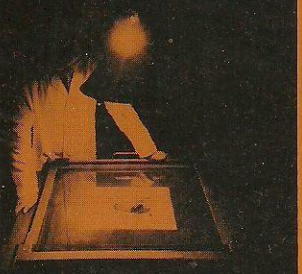

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The Monotype Corporation Limited was one of the first recipients of The Queen's Award to Industry for achievements both in increasing exports and in technological innovations

The Monotype Corporation Limited

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Head Office & Works: Salfords, Redhill, Surrey, England

Registered Trade Marks: Monotype, Monophoto

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Bombay	Dunfermline			

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The Monotype Recorder

Volume 43 Number 4 Autumn 1969

The Innovators

A review of the progress of Pictorial Machinery Limited

1919-1969

The Monotype Corporation Limited

The Founder

Fifty years ago, writers in the printing trade press gave a warm welcome to the birth of Pictorial Machinery Limited. The simple reason was that they already knew more than a little of the ability, experience, character and enthusiasm of its founder and managing director, Frederic Thomas Corkett, F.R.P.S.

He was born on 7 September 1866. His paternal grandfather who came from Oxfordshire, owned a smallholding at Soulbury (near Leighton Buzzard) and was well known in the early part of the 19th century as a sheep-dealer. The family name of Caldecott was accidentally changed when Frederic's father, John, first went to school. Frederic himself recalled the incident: 'My father, being the eldest of the family, was the first to go to school. The village schoolmaster asked him his name, and as Caldecott is, or was at any rate then, pronounced "Cawcott", the wooden-legged and somewhat wooden-headed dominie wrote down my father's name as Corkett. My uncles following on at the school became Corketts too, and that is how we became possessed of our family name. My grandfather could write only with difficulty, and evidently could not read it after he had written it, judging from some of the specimens I have, so he never put the matter of name right.'

John Corkett (1819–94) was a shoe-maker. He learned his trade in Aylesbury, worked for a time in Soulbury and eventually set up his own shop in the neighbouring townlet of Winslow. His wife, Ann, was a teacher, and this may account for the fact that Frederic, the youngest son in a family of eight, could read by the age of four. He later claimed that books were his chief interest in life for many years – anything from *Robinson Crusoe* to Marcus Aurelius. Formal education followed his home-learning, first at a dame's school, then at the local church school and finally at John Grace's Grammar School in Winslow.

Frederic's appetite for books led to his being apprenticed at the age of 14 to a local printer, who gave him a starting wage of 2*s*. 6*d*. a week. At this time he was already devoting much of his spare time to the new technique of photography; and, like many another's hobby, it came to occupy a key position in his career. His first camera was of his own construction, with a lens that had previously been part of a telescope.

An early link between his picture-making and printing were the engraved illustration plates he handled at work. He was never grudging in appreciation of the skill of the engravers – 'a technical excellence that left nothing to be desired' – producing and reproducing beauty without sacrifice of fidelity to the subject. The chemically-etched halftone was still in the womb of the future.

His four-year apprenticeship completed, young Corkett set about widening his experience. He worked for 18 months at a printing firm in Cardiff. Starting time was 6 a.m. and the wage 16*s*. a week, out of which his lodging took 12*s*. In later years, he recalled with relish the taste of the coffee and bun that, for the price of a penny, cheered his early-morning walk. Having little resource for amusement, he found the local Free Library a treasure-house and read all he could find on printing and photography.

In March 1888, he transplanted himself to Faversham, Kent, where he worked for a house-furnisher. According to his employer's testimonial, he proved a 'good salesman' and was helpful in book-keeping and advertising. Thus is experience won!

Then he heard the call of London. It was as a compositor that he joined a small firm of printers at King's Cross before moving on to another printing firm near Cannon Street. His next employer was an Irish-American, whose knowledge of print lagged far behind his commercial instinct. He was content to put Corkett in charge of his small Oxford Street printing shop opposite Frascati's where, for publicity purposes, some of the work was done in full view of passers-by.

With spare time and money a little more plentiful, Corkett's passion for photography was again exercised. He studied at the Regent Street Polytechnic and bought a camera. With this he entered the ranks of the 'shamateur', giving up his week-ends to copying documents and to the recording of wedding and club groups. With a colleague, he invented a camera of the type known today as 'reflex', but as it received no trade welcome at an amateur exhibition he neglected to protect it by patent. A year or so later, reflex cameras suddenly achieved popularity, but he now had something fresh to occupy his mind.

He had been deeply impressed by the remarkably artistic products of collotype printing and was glad to find an old craftsman, W. T. Wilkinson, established near the Elephant and Castle, to give him a long series of lessons in the technique. From all of which it will be seen that, though still in his early twenties, Corkett was gaining professional knowledge in width and depth, thereby buttressing his range of practical ability.

After his relative independence in Oxford Street, it was at the sacrifice of some status that he became foreman compositor to a small jobbing printer in Little Britain, close by St Bartholomew's Hospital; but he soon regained the title of 'manager'. Among the customers of the firm was a vigorous – Corkett says 'impetuous' and 'bustling' – young man who, on Friday nights would bring in the barely decipherable copy for a small journal, *The Private*

Schoolmaster, to be published the next day. To add to the general stress, this publication at times required the insertion of Greek or Arabic characters, but this did not cause the customer – a Mr Harmsworth – to relax his requirements. Somewhat to the printer's satisfaction, the paper was short-lived; but less transient was another of Corkett's tasks for the same man. He set up the first page of *Answers*, the popular weekly that founded the fortunes of the future Lord Northcliffe.

The next stages in Corkett's career have been inconsistently recorded, and the reasons for the frequent moves remain obscure. A deliberate extension of experience may have been his motive, but perhaps, also, the single-mindedness of ambition had not yet been moderated by tact and diplomacy; Corkett was a very determined young man. Responsibility for the running of a small printing shop at Soham in Cambridgeshire was his next care, but this lasted only a matter of months before engagement with the *Bucks Herald* at Aylesbury, and subsequently with the *Kent Examiner* at Ashford. After that, he worked for a few weeks for a printer in Stamford, Lincolnshire: 'an impossible person who wanted merely an automatic docile machine of no originality.'

Deciding that it was no longer worthwhile to resist his inner craving, he abandoned the practice of print and became professional assistant to an established photographer in the town, for whom he worked for 18 months before resolving to set up his own establishment. From the first week, Frederic T. Corkett, the New Photographer, of 4 St Peter's Hill, Stamford, never wanted for work. Not yet 26 years old, he was now his own master, with an enthusiasm bounded only by a growing commercial prudence. He issued a circular announcing that he was 'prepared to wait upon Ladies and Gentlemen at their own Residences to give lessons and hints' on photography. Apart from his studio or outside appointments, he claimed to have photographed almost every church and object of interest within a radius of 20 miles, building up the material for a series of lantern lecture-tours which were both financially rewarding and excellent publicity. In this work he was greatly helped by his wife, and he has recorded that an 18-hour day for each of them was no unusual occurrence.

In 1894, he sold his retail business and studio, and moved to Leicester where he acquired two properties, one for a studio and the other for developing his interest in the collotype process. He wrote and published *How to Print Collotype*, but, although his results were technically encouraging, he found it impossible to compete with German imports. Wisely, he withdrew from this technique and turned his attention to another sphere of photographic reproduction.

Picture postcards are believed to have been originated by a French stationer in 1870, but until 1894 such 'frivolities' had been banned by the British Postal Authority. The artistic picture postcard was a novelty in which, again, the lead had been taken by Germany, and it soon became a craze. When the British veto was withdrawn, Corkett issued a modest collection of well-chosen views of his neighbourhood. Though George Stewart & Company of Edinburgh, with pictures of that city, had anticipated him by a month, he claimed to have the first series of *English* pictorial view postcards. Some of these were bromide prints or collotype reproductions, but the most rewarding medium was clearly the halftone plates of his own making. At first only monochrome was involved, but Corkett was soon probing the requirements of three-colour working, although a section of the printing trade was vehement in condemning it.

Obviously both the postcard business and the studio were well organised and capable of maintaining quality production without close supervision, for he was able to travel the whole country with his camera in search of pleasing natural subjects. While working in the Channel Islands, he met Count Osterog, at that time managing director of the fashionable London photographers, Stas Walery Ltd. The Count was so impressed with what he saw of Corkett's methods and results that he agreed to retain him on a fee basis for the firm's out-door special engagements. Consequently, when Queen Victoria's Diamond Jubilee was celebrated in 1897, with (amongst other spectacles and festivities) a Naval Review at Spithead on 26 June, it was Mr Frederic Corkett who was appointed the Official Photographer of this occasion. He must have felt that, with this mark of public recognition, his 'hobby' had reached maturity.

Some 600 prominent people were invited to witness the Review at close quarters from R.M.S. *Teutonic*. As a memento of the occasion, a large number of photographs were taken of the distinguished guests. These were reproduced by photogravure and issued in a special album, on the cover of which was gold-blocked: Teutonic Pictures by F. T. Corkett (Chief Operator, Walery Ltd). One interesting coincidence for readers of *The Monotype Recorder* was that one of the people photographed by Frederic Corkett was the Earl of Dunraven, who at the time was negotiating with the American proprietors for the manufacturing and selling rights of 'Monotype' machines. The Earl became the first chairman of the company that later was to be known as The Monotype Corporation Limited, which in 1955 became the parent company of Pictorial Machinery Limited.

The following year took Corkett to Canada to do special work for the Immigration Department of the Canadian Government and the Canadian Pacific Railway. He returned home to find that his studio connections had not diminished and would not be impaired by continuation of his role of Photographer at Large. It was in the summer of 1900 that he was engaged in recording a view of Filey Bridge on the Yorkshire coast when a passer-by opened conversation. The stranger was knowledgeable and aware of Corkett's name and work. He introduced himself as Adolph Tuck, managing director of Raphael Tuck & Sons, the art publishers. The firm was prepared to purchase the Leicester photographer's business – a business that had prospered to the extent of selling over half-a-million postcards in the first half of 1900. No record remains of the price paid, but Corkett was installed as manager of the Tuck Postcard Department at Milton House, Chiswell Street, London. Within two or three years, he had 30 artists and other assistants working under him, capable of an annual output of 2,000 originals in oils and water-colour.

By 1906 the monotony of the Raphael Tuck routine had become irksome to Corkett's progressive outlook, and he severed his connection to widen his activities. He established the

St Paul Studio of Design at 2–4 Cheapside; and at the same address was the Fine Arts Publishing Company Ltd, with himself as manager of the Art Miniature and Commercial Department. In the following year, he was appointed art agent and adviser to Valentine & Sons Ltd, and he still found time to take on the job of joint manager (with Frank Colebrook, the printing trade auctioneer and valuer) of the British section of the Paris Exposition du Livre. His energies still unsatisfied, he took a hand in local politics and continued to lecture widely.

But all the time, his heart was in research. He was experimenting with a machine for rotary gravure, based upon the 'Rollotex' machine designed for use in photogravure textile printing. His notebooks recall that the 'Rembrandt Printing Company commenced operations in 1894 and in 1896 was doing beautiful work . . . While I never had any direct contact with the first Lancaster printers . . . I set myself the task of unravelling the process, for it was evident to me that in the mechanism, the ink, the design, the cylinder, there was much to develop or adjust . . . I met with very considerable success entirely on my own and I procured my first satisfactory intaglio print on a reel of paper in 1907.'

Due to the success of the very attractive series of Burlington Art Miniatures, the Fine Arts Publishing Company moved to larger premises in Charing Cross Road, where Corkett built a second photogravure machine. It attracted favourable attention when it was exhibited to the printing trade at Thanet House in Fleet Street. Technically, it was sound; commercially, he gained the close and active interest of American friends, notably Joseph Palmer Knapp, head of the American Lithographic Company, a firm of the first importance, with which Corkett was to be closely associated for several years.

Having obtained a sympathetic hearing from Edward Hunter, of the Sun Engraving Company Ltd, and James Forman of Nottingham, he formed with them the Mezzogravure Company to exploit the process and machine on this side of the Atlantic. In 1908, he left for America, sufficiently confident in the links already established there to take his family with him. Initially, there were further developments of the gravure machine, a matter of no great difficulty, considering that the inventor's brain and the manufacturing facilities and wide experience of the American Lithographic Company were all brought to bear on the project. This work may well have been the raison d'être of the Corkett Intaglio Company of New York, a subsidiary of the American Lithographic Company. Subsequently, the Alco Gravure Company was inaugurated as a concern to print the photogravure supplements for American newspapers, which were already in considerable demand.

In 1912, Corkett returned to England to organise all the Continental business and to deal with the enquiries that had already been received from Japan, New Zealand and South Africa. In addition there was the whole of the domestic British market to be explored. Although the Mezzogravure Company had not prospered in his absence, Corkett made a start by renewing his association with the Sun Engraving Company and James Forman. As a result, the first of the £1 and 10*s*. notes – the 'George and Dragon' pattern Bradbury notes – were printed by the newly available process.

The British Printer for April/May 1912 included some interesting comments: '. . . the Corkett Intaglio Process undoubtedly excels, for it is a process yielding the very highest quality. The deep shadows, whilst velvety, are transparent, and yet retain purity in their highest lights, with every graduation of tone in between . . . For purposes of super illustration, for supplement purposes and for the more artistic requirements of the printing trade, Mr Corkett believes that the rise of intaglio is as sure as the rising of the sun.'

As if this wide field offered insufficient occupation, Corkett was now brought into contact with Messrs Miller and Motley who had arrived in England from America with a new photographic device invented by themselves and taken up by the American Lithographic Company. It was called a 'step-and-repeat' machine. Its function was to reproduce an identical image in multiples on a single plate, with the positionings of the repeated images regularised to a fine degree of accuracy by mechanical means, completely avoiding dependence on the human hand and eye. Corkett immediately recognised the practical advantages of such dependable exactitude in ensuring precision of register for the colour printing and guillotining of such work as labels and postage stamps.

Unfortunately, the First World War interrupted Corkett's involvement with this new process (he was rejected for service on health grounds and returned to his old business as a commercial photographer), but in 1918 his mind at once turned back to the 'step-and-repeat' machine. It formed the central feature of what was termed the 'Lithotex' process (previously 'Printex'), the plant for which also contained the means for illumination and printing-down, together with a number of accessories. The original offer of this equipment in England had been hampered by a price that was considered unduly high and by salesmanship that was lacking in technical knowledge. Corkett was not worried by the latter consideration; and, since the British patent rights had been dormant for some years, he thought it likely that their price might now be attractive.

Promising though the prospects were, capital had to be found to vitalise them. Corkett approached Charles Henry Crabtree and Arthur Eastwood Crabtree, the Leeds engineers, and they agreed to put up the funds necessary to enable the 'Lithotex' process to be exploited. A small private company was formed for the purpose, and Pictorial Machinery Limited was duly registered on 20 May 1919.

Step-and-Repeat Machines

It seems amazing that, when Pictorial Machinery came into being 50 years ago, all of the photomechanical processes were in their infancy. At that time, process camera studios practised wet-plate collodion photography almost exclusively and continued to do so for the majority of negatives well into the early 1950s. Photoengravers had established a fairly brisk trade in line and halftone blocks for letterpress printing, but photolithographers and photogravure printers were thin on the ground. Much lithographic work was still printed from stones, but with zinc and aluminium plates making some head-way. Hand-drawn lithographic images were a commonplace, though conceding ground grudgingly to photomechanical methods. Photogravure had gained footholds in certain specialised areas of production, like textile printing, but was only slowly finding a broader base. F. T. Corkett, the first technical innovator of Pictorial Machinery, was principally dedicated to the promotion of photolithography and photogravure and tended to regard photoengraving with a certain disdain, though not ignoring the business opportunities that the market afforded.

Pictorial Machinery Limited was registered as a private company in 1919 for the express purpose of taking over and exploiting the patent rights of Lithotex Limited, a dormant business incorporated in 1915. Three photomechanical appliances were covered by the original patents: a step-and-repeat machine, a printing-down frame, and a roller transferring machine. Seemingly, the intention of the inventors was to sell the three items as a package for photogravure textile printing, but F. T. Corkett had wider vision and saw the potential of the step-and-repeat principle for work on paper. Each of the three items will be dealt with under its appropriate technical heading, but the most important of them was undoubtedly the device that became a 'Lithotex' Standard Auto-Focus Step-and-Repeat Machine: the world's first device for producing multi-negatives. This machine, together with its successors, was to establish the reputation of Pictorial Machinery as a firm where new ideas were applied with precision.

'Lithotex' Standard Auto-Focus Step-and-Repeat Machine

In essence, the 'Lithotex' Standard machine was a projection camera that had to be erected in a small partitioned darkroom, the lamp and unit housing being on the daylight side of the partition, to exclude extraneous light from the sensitive plate, with the operator on the darkroom side operating the controls for stepping-up the image after each exposure. Since the negative-working albumen platemaking process was the most popular at the inception of the machine, a positive was usually loaded in the unit-holder and illuminated from behind by a bank of six mercury vapour tubes. Maximum positive size was quoted as 10×12 inches. By means of a lens system, the unit positive was projected on to a wet collodion plate and could be stepped-up to produce a multi-negative of 25×35 inches after photographic processing.

On the darkroom side, the machine incorporated a holder for the sensitive plate or film, the movements of which were governed for stepping purposes by lead-screw mechanisms at 5 turns per inch. Towards the top right-hand side of the machine was a dial for indicating horizontal movements to the plate-holder, while lower down was a similar dial for determining vertical movements. Both of these dial controls were scaled from 0 to 100 and each division represented a movement of 0.002 inch: a measurement quite alien to the lithographic industry of the 1920s when less precise standards were the norm. By placing a focusing screen in the plate-holder, the operator could observe the image for size and squareness and make adjustments by means of a handwheel. Enlargements up to $2\frac{5}{8}$ and reductions down to $\frac{5}{8}$ were possible by turning the control, while a ratchet inside the handwheel enabled the image to be squared. Image focusing was automatic irrespective of machine setting, but size and squareness had to be checked visually on the screen.

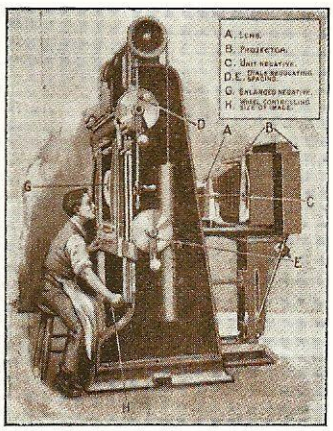
Once the image had been satisfactorily established, the operator substituted a wet collodion photographic plate for the focusing screen and projected the positive into position. Afterwards the plateholder was *stepped* to the next pre-determined position by manipulating the appropriate controls, and the projection of the positive was *repeated* alongside the previous exposure. So the cycle of *stepping* for position and *repeating* for exposure was continued until the required multi-negative had been formed.

From a distance of 50 years, the full import of a step-and-repeat machine to the printing industry of the 1920s is difficult to grasp, since nowadays such devices are commonplace. Yet, prior to 'Lithotex' machines, the only method of producing multiple images on a lithographic plate was by a tedious process of hand transferring. The process began with a unit or basic design that had to be stepped-up: the design could be hand-drawn or photographically formed on a lithographic stone or plate. Next, the design was inked-up and printed on to a sheet of specially-treated paper in a transfer press. Afterwards the paper bearing the image was placed in the exact position required on

What is Meant by "Step-and-Repeat"?

By FREDERIC T. CORKETT, F.R.P.S.

To produce any subject in multiple series—as in the case of labels and the like printed in large sheets and cut afterwards—there are numerous ways of procedure which could be reasonably described as "step-and-repeat" methods. Even to space out duplicate formes of type by hand with the use of a foot rule might come within the category. But in the "Lithotex" process, which has made the term "step-and-repeat" familiar, something very different is connoted, and it may be worth while to clear away some confusion that seems to exist on the subject. The "Lithotex" process is a method of obtaining a negative of a subject in multiple repetition, which negative, or "multi-negative," can be printed by artificial light on to a metal plate,

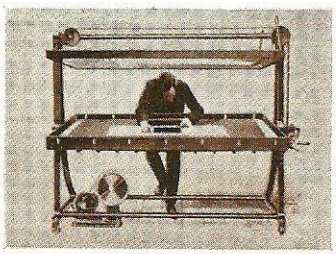


The "Lithotex Step-and-Repeat" Machine.

the metal plate so made being adapted for use either in typographic printing or lithographic printing (offset or direct). And, be it noted, this process cuts out all stereotyping or plate duplicating as done in typographic printing, and eliminates also all transferring, as is usual in lithographic printing. Further, it should be noted that original plates in multiple series are produced and that consequently impressions from these original plates are of higher qualities than such secondary impressions as are obtained from transfers, stereos, etc. Moreover, and more important still, register—*i.e.*, the fitment of one printing colour to the other—is necessarily very much more exact than can be obtained either from a multiplicity of blocks, all specially mounted and generally of varying heights, or of transfers placed down by hand. These points are denied by no one. Really it would be futile for any one to say that older methods of obtaining register can equal the mechanical precision obtained by the patent "Lithotex" appliances.

But to describe the process, one must start at the beginning. In the first place you photograph your original, that is, you make a negative of whatever you are requiring—letterpress, design, drawing, map, portrait or any illustration either in monochrome or colour—and you make this negative by the aid of "Lithotex" metal cameras. "Why Lithotex cameras?" Because "Lithotex" metal cameras yield images that are dead square and in exactly correct proportion to the copy. Other cameras can be made to do this, but with "Lithotex" cameras you cannot very well do otherwise. In the "Lithotex" method the copy is illuminated by special arc lamps, and when you get used to copying work with "Lithotex" lamps, which throw a magnificent pure white beam of light, you will need no one to tell you that there is nothing else better. Having made your negative, therefore, you proceed to make a positive therefrom; the positive is retouched and is then ready to be taken to the "Step-and-Repeat" machine. What this machine does is to make a large negative (any size up to 31 ins. by 22 ins.), which can be made up of just as many images as required, for it is from these stepped-up negatives that one prepares a printing plate. Let us suppose our job is a two-colour label, say in black and red. We have made our first multi stepped-up negative of the black plate, and now we have to make the negative for the other colour with the same number of images. All we have to do is to place the second plate in the "Step-and-Repeat" machine, and with the same mechanical movements the second plate is made in just the same manner as the first. (Sounds simple, does it not? And it is indeed simplicity itself; only, of course, demanding exactness, patience and a close following out of instructions.) Now, with our two multi-negatives, in each of which we have, say, 40 images of our label, one multi-negative of the red and one of the black, our next operation is still simpler, for all we have to do is to pour some solution (which anyone can make up in a few minutes) on to a metal plate and dry it in a drying machine. This being done—and ten minutes or so will be all the time necessary—the metal plate is placed in the "Lithotex" printing frame, the negative on top of the sensitive surface, and is tightly secured, and when the proper operations have been concluded (namely, merely exposing the negative on top of the metal in front of the "Lithotex" lamps and rolling up the plate so exposed with ink, followed by the washing off of the solution), the printer finds himself with a wonderfully clean and crisp lithographic image to print from, an image which can be printed from direct or by offset, yielding a wonderful result in monochrome or colour. This is the real revolutionary process which is making such headway as to be the talk of the trade.

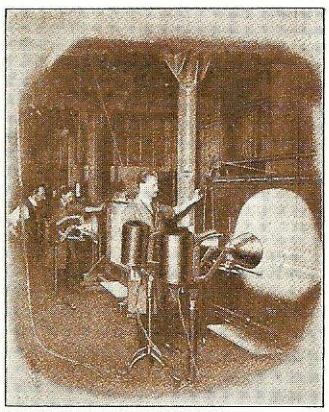
"Do the plates last?" you ask. An extract from a recent letter which I have received will serve as an answer: "I see no reason why I should withhold from you the output from our 'Lithotex' or 'Printex' plates. Our record is over 500 reams. Our average, with conditions absolutely satisfactory, is about 200 reams. On a single-colour machine (when properly tuned up) there is no reason why 300 reams should not be obtained. In the above remarks I am referring to offset machines." Just think of 250,000 runs from one photo-litho metal plate!



Using the "Lithotex" Printing Frame.

"Are the multi-negatives exact?" Well, you can scarcely look 50 yards in any direction without seeing around you impressions produced by the aid of "Lithotex" plant—match box designs, cigarette wrappers, soap cartons, tin labels, stamps, cheque tints, playing cards, show cards and printed wrappers, with all kinds of illustrations and designs. Now, if the "Lithotex Step-and-Repeat" machine could not give exactness, this flood of work everywhere over England would not be in existence.

A good deal of misunderstanding or misrepresentation has existed at various times regarding "Lithotex." At first the workpeople objected to "Lithotex" mechanical methods. It was said that the "Step-and-Repeat" machine would throw out of work many artists and transferrers. As a matter of fact "Lithotex," while undoubtedly displacing a certain type of craftsman, makes a place for others, and results have proved that in the end more printers are required and more printing machinery is needed to cope with the larger amount of work printed, so that it really creates more labour than it displaces. Then, again, vested interests were busy. Would-be competitors suggested that this or that appliance, though "very good, you know," was very expensive, the process being thus "damned with faint praise" by those who had nothing of equal merit to suggest as an alternative. The very latest phase of opposition is to tell the trade that anyone can do step and-repeat work. Whilst this is true, if one uses the term "step-and-repeat" in its widest application, printers should note that the patented "Lithotex Step-and Repeat" methods are the results of very many thousands of pounds spent in investigation and development, and they involve apparatus which is thoroughly protected from being copied by others. There is not a detail but has been carefully tested with all the available skill of experts of the process world in consultation. To-day "Lithotex" is a well-tried-out method, and is backed up by expert craftsmen, advisers and helpers, whose standing is such that the printer who deals with the company concerned (Pictorial Machinery, Ltd.), can be assured that he is in touch with workers who are real specialists in material and plant for the graphic arts.



"Lithotex" Lamp and Frame in Use.

BRITISH INDUSTRIES FAIR.—An impression of the stationery and printing section of the British Industries Fair, given in the *Board of Trade Journal*, is as follows: "Business rather quiet, but certain firms express themselves as highly delighted with the orders taken. Among the markets in which new customers have been secured are Canada, the Netherlands, and Portugal." It is also announced that a firm exhibiting in the stationery section secured a £1,000 order as the sequel to inquiries made by a new customer at the 1922 Fair.

REPORTING on the Scottish paper trade, a Glasgow correspondent states that paper-makers are experiencing a good export demand for India, Australia and New Zealand. Some new lines—previously the monopoly of foreign rivals—have been developed with satisfactory results. These include kraft wrapping papers, box boards and cigarette papers. Something is hoped for also from the "bread-wrap" idea—an effort to ensure that every loaf of bread sold over a baker's counter is only handled outside a paper covering.

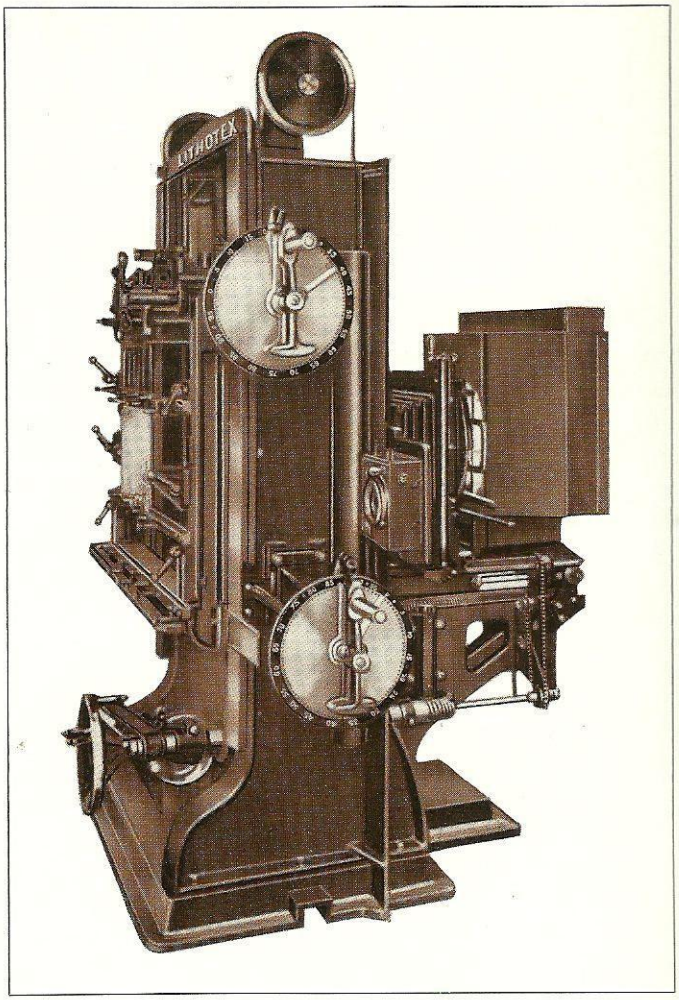
the machine plate and the same transferring process carried out in reverse to establish the image ready for printing. This cycle of operations had to be repeated over and over again until the requisite number of images had been put down on to the plate.

In the *British and Colonial Printer* of 2 August 1923, F. T. Corkett contributed an article on 'Photo-Litho Printing Surface Production' and attempted to compare the working times of hand transferring with mechanised step-and-repeat methods. He remarks that '. . . a 31 × 22 inches multi-negative made in a 'Lithotex' Step-and-Repeat machine can be printed-down four times within the hour and consequently produces a 65 × 45 inches photo-litho printing surface all ready for the machine within an hour. As such a multi-negative may have as many as 100 repetitions of a design upon it . . . and being printed-down four times provides in all 400 repetitions, or 400-up as the printer says, it will be readily clear that no hand transferrer can compete with such repetition.'

Industrial inertia, ignoring new ideas, was no less potent in 1919 than it is today, but additionally the early years of Pictorial Machinery coincided with adverse trading conditions and the severe depression of the middle and late 1920s. In the year of the General Strike 1926, F. T. Corkett resorted to patriotism as a possible means of drumming up business. Some press advertisements for the company during that year opened with a quotation from Major the Hon. O. Stanley, M.P. 'Many of us may be wondering what we can do to help in the war which our great basic industries are waging against depression and even extinction.' Never lacking an answer, F. T. Corkett was swift to suggest a course of action for master printers. 'All shades of politicians and patriots will agree that in one phase of business there can be no two opinions and that is the very real necessity for helping and supporting British-made manufactures. If there is one class of operators that deserve and have earned the gratitude of the British public it is the working fitters, mechanics and engineering operators of our great engineering industry, for they are facing hard times and low wages with equanimity.'

Confronted with widespread unemployment, the trades unions during the 1920s kept an anxious eye on any technical development that might exacerbate an already tragic situation. The mechanisation of hand transferring, implicit in the step-and-repeat technique, must have caused some consternation, though in retrospect quite unnecessarily. By December 1921, the two main lithographic unions had met and agreed on a demarcation formula for operating 'Lithotex' machines. It stated that members of the Society of Lithographic Artists, Designers, Engravers, and Process Workers would execute work through to completion of the stepped-up negative, while members of the Amalgamated Society of Lithographic Printers would print-down the negative and develop the machine plate. The Master Printers' Federation Labour Committee ratified the agreement in January 1922. In many respects the 1921 negotiations were very significant, since the principles reached were destined to regulate the working of all photolithographic processes up to the present time.

In any event, the labour agreement came in good time because Pictorial Machinery did not achieve its initial sale of a 'Lithotex'



Standard Step-and-Repeat Machine until 1923. Patterson Shugg Pty Ltd of Melbourne took delivery of the first machine in January, followed in quick succession during the same year by a number of other users both at home and abroad. The machine remained in production until 1934, and various improvements were made to it before that date. Perhaps the most ingenious was a 'Lithotex' Automatic Time Clock that controlled the opening and closing of the lens shutter. Automatic shutter activation from a timing device represented a great leap forward in quality control.

Many of the machines were employed for stepping-up stamps and currency notes in security printing at the Reichsdruckerei in Berlin, at Enschedé en Zonen in Haarlem, and at the Egyptian Government Printing Office in Cairo. The Betta Manufacturing Co. Ltd in Enfield employed their machine on the making of nameplates; Mardon Son & Hall Ltd for cigarette cards and packets; S. H. Sharp & Sons Ltd in Leeds for gravure textiles; John Waddington Ltd for playing cards; while most of the other users were engaged in packaging and general printing.

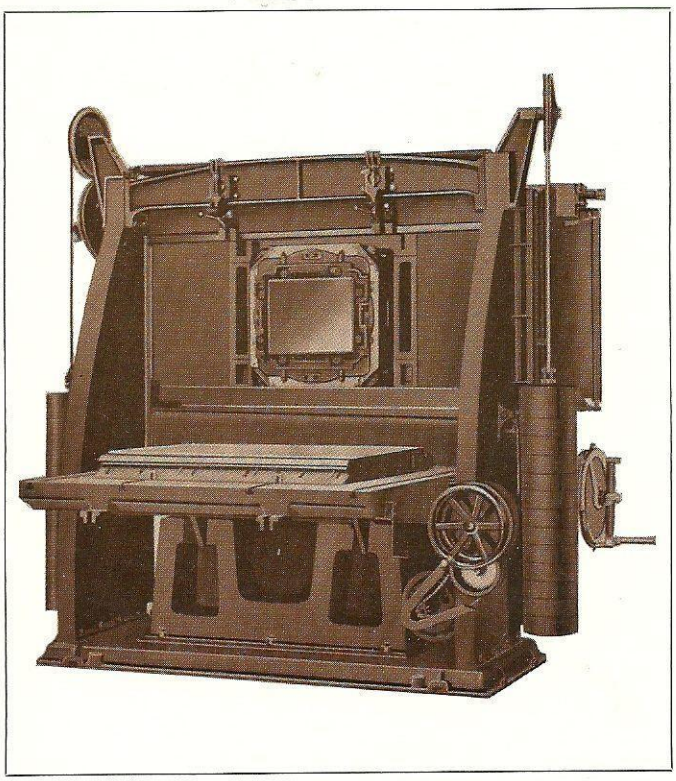
By 1926 a 'simplified' 'Lithotex' step-and-repeat machine had been announced which sold for £1,000 less than the Standard model. It was a smaller machine than the Standard with a maximum multi-negative size of 25 × 31 inches; the focusing was manual and not automatic.

'Printex' Mechanical Negative Printer

In 1922 work was started on a step-and-repeat machine for printing-down a negative to a sensitised metal plate of 40 × 60 inches. In the *British and Colonial Printer* of 15 March 1923, a Pictorial Machinery advertisement made what must have been a premature announcement about the availability of the machine, because silence ensued until the London Printing Exhibition of 1925 where a 'Printex' Mechanical Negative Printer made its long-awaited debut. It was a gigantic machine with massive solid castings for the framework, the entire unit weighing some 4 tons, standing 10 feet high, and occupying a floor area of 18 square feet.

At the back of the machine was an upright bed where the sensitised machine plate could be clamped into position and held taut. For loading, the bed was manually lowered to a horizontal position, but for exposure it reverted to the vertical plane. Machine plates up to 53 × 66 inches could be accommodated.

Three negative carriers were supplied as standard parts of the machine kit, so that the subjects could be prepared, mounted, and squared in advance of machine usage. Once loaded, the negative carrier was secured in position and illuminated from behind by a suspended arc lamp. For stepping purposes, the whole of the light box and negative assembly had to be moved by hand-operated lead screws in front of the stationary and vertical machine plate. Two hand controls, similar to those on a 'Lithotex' Standard machine, were fitted for exercising horizontal and vertical movements respectively in increments of 0.002 inch. Horizontal movements were not too difficult to effect, but the vertical movements of a robust assembly must have proved to be more troublesome and necessitated enormous counterweights suspended from wires running over a pulley mechanism.



Contact between the vertical plate and negative was by mechanical pressure not vacuum, the pressure being exerted at several points. Audio-visual signals were incorporated indicating to the operator that contact had been established and warning that the stepping mechanisms must not be actuated. A 'Lithotex' Timing Control was fitted for governing the length of exposure which, being made to a bichromated-colloid plate coating, could be conducted in subdued daylight.

In most respects the underlying concept of this machine was in advance of its time and overstretched the constructional techniques and materials then available. Movement of the heavy negative and light box assembly to pre-determined stepped positions in front of the vertical machine plate, allied to the strain of pressure contact, imposed too great a demand on engineering know-how, and the project was soon diverted along new paths towards the realisation of a horizontal 'Printex' Junior Mechanical Negative Printer.

Although the 'Printex' Mechanical Negative Printer was short-lived, the machine can lay claim to the distinction of being the first European-built step-and-repeat machine for exposing negatives to lithographic plates. Moreover, the vertical concept was fundamentally sound and came to fruition in the series of 'Lithoprintex' machines that emerged after 1955.

In the *British and Colonial Printer* of 30 July 1925 mention was made of the first, and only, delivery of a 'Printex' Mechanical Negative Printer to a firm in Leipzig. Apparently the machine functioned satisfactorily until destroyed in the last war.

'Printex' Junior Direct Mechanical Negative Printer

Although the big 'Printex' Negative Printer must have been a disappointing set-back, the lessons learned from the project were to be very profitably applied to a simplified horizontal machine, the 'Printex' Junior Mechanical Negative Printer. The machine plate lay horizontally for exposure to a negative superimposed in pressure contact. Neither the plate nor the negative occupied a fixed position, but each was moved by lead-screw mechanism as required. Additionally, a chain-and-ratchet control was fitted to ensure a positive setting once a stepped position had been reached.

To operate the machine, the negative had first to be mounted and squared in its portable holder before being clamped into position under the light box on the bridge of the machine: the light box providing housing for an arc lamp. Then the sensitised metal plate was stretched taut across the machine bed. With the preliminaries over, the negative and plate were brought into proper correlation for the initial exposure. Normally, the machine bed carrying the plate was moved length-wise to secure the necessary steps parallel to the press gripper edge, while the negative was moved for the breadth-wise steps at right-angles. Thus, the first line of exposures was usually made along the gripper edge of the plate by actuating the lead-screw mechanism propelling the machine bed. Then the negative was moved across one step by its own independent lead-screw drive, thereby allowing a plate traverse for the next sequence of exposures parallel to the first row.

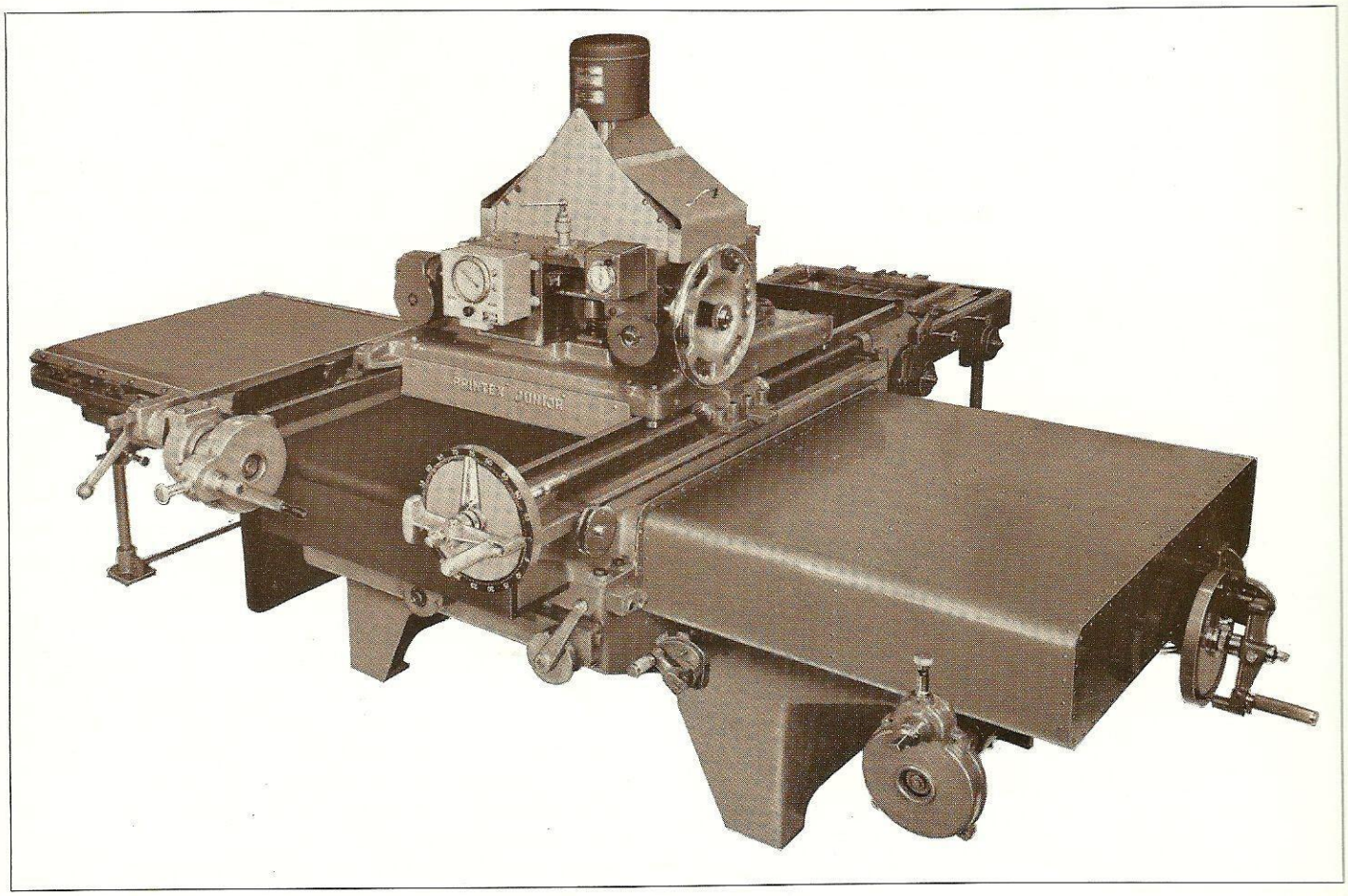
Mechanical pressure was used to bring the negative and plate

into contact, an easier matter with a horizontal machine. Exposures were automatically timed. The manual controls for stepping were virtually identical with those on the Standard machines, the calibrations equalling 0.002 inch. The Junior accepted machine plates or stones up to $42\frac{1}{2} \times 53\frac{1}{2}$ inches with a maximum printing area of $37\frac{1}{2} \times 53$ inches. Negatives up to a maximum of 16×20 inches could be accommodated.

Success came instantly for the 'Printex' Junior and no less than 10 of them were delivered during 1927, seven to Germany and one each to South Africa, Hungary and England. Demand did not slacken in the following years and more than 200 were delivered before its withdrawal from the market in 1958. Drummond Brothers Ltd of Guildford built the major share of machines, but to accelerate production and catch the post-war boom Vickers Ltd were enlisted to undertake a fair amount of manufacturing from 1946 onwards, though the last nine machines were built by Pictorial Machinery themselves.

Within the first decade of becoming available, the Junior machine had infiltrated almost every branch of the diverse printing and allied trades, ranging from packaging to metal decorating, and from security reproductions to textiles. From the outset, the accuracy of the 'Printex' Junior equipment became a byword in the industry and the machine received accolades from various sources, even from exacting and unemotional engineering circles. An issue of the *American Machinist*, dated 27 April 1929, contained a lengthy article on the 'Printex' Junior which bordered on a eulogy. The article concluded: ' . . . errors in the stepping process are held to the rate of not more than 0.01 inch in 6 feet . . . In connection with banknote work in an overseas country [probably Germany] the test applied was to produce a square of 27 inches side from an original line of 10 inches long which was cut with a razor blade in smoked glass. The square had to be produced by steps of 9 inches at a time, that is, with a 1-inch overlap. Thus, to form one side three steps were taken, including the original line, with overlaps of 1 inch; then the negative was removed, turned through 90 degrees, and three more steps taken, each at 9 inches, this process being again repeated twice to complete the square. It was required to show no joints in the overlaps and the diagonals of the square had to be exact to size as measured by eye. This test was successfully met.'

Not bad for 1929 and Pictorial Machinery could almost have been excused for resting on their hard-earned laurels now that trade had become relatively brisk after an arduous and slow beginning. Yet between 1927 and 1958 plenty of refinements and modifications were made to the machine to match changes in market demands and to take advantage of engineering advances. The most important of these was a multi-negative attachment, whereby a printer could employ the Junior machine consecutively for the production of multi-negatives or stepped-plates; the former necessitated darkroom operation, whereas the machine had previously always been worked in subdued daylight and could still be for platemaking only.



'Lithotex' Junior Auto-Focus Step-and-Repeat Machine

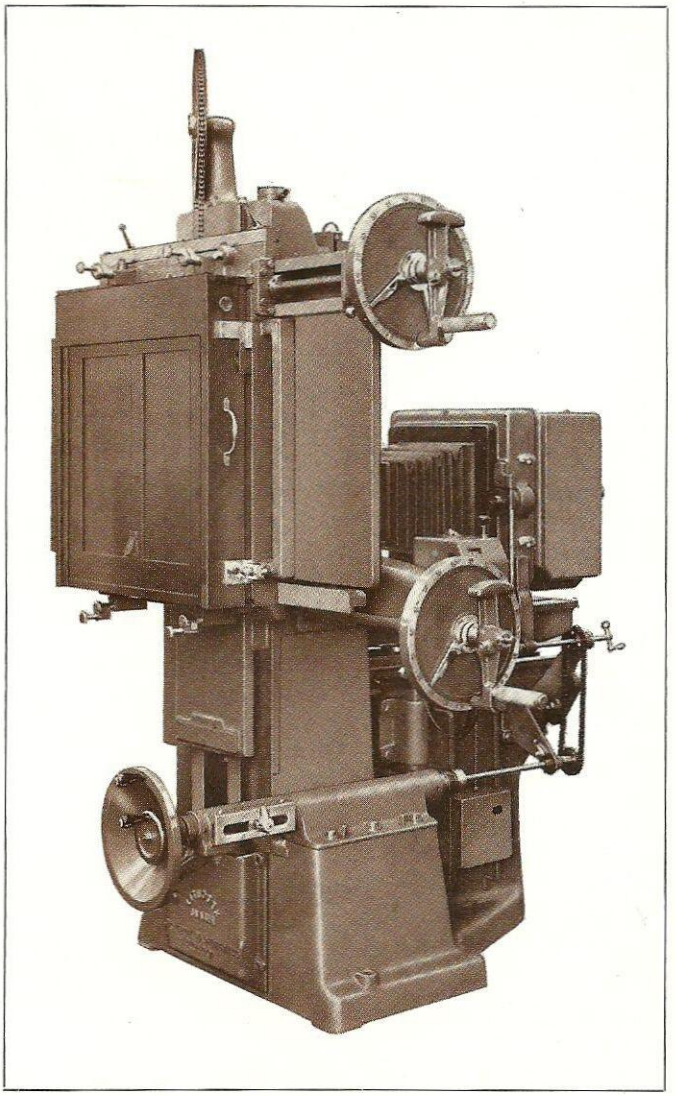
Pictorial Machinery made another thrust forward in 1930 by bringing out a 'Lithotex' Junior Auto-Focus Step-and-Repeat Machine. So valid was the technical concept of the new machine that it endured for 35 years before being taken out of manufacture as recently as 1965. It was a derivative from the 'Lithotex' Standard model, but in one or two important respects broke new ground. Unlike the Standard machine that produced multi-negatives up to 25 × 35 inches, the Junior was limited to 20 × 20 inches. Instead of being darkroom-operated like the Standard, the new model could be installed in a daylight area which served as a psychological fillip to operators and added to the appeal of the machine. Furthermore, the installation costs were reduced by dispensing with a specially partitioned darkroom. Incorporated in the design was a darkslide (always used on gallery cameras) for carrying photographic plates and films between the darkroom and the step-and-repeat workshop. Overall, the construction of the Junior appeared to be a tidied-up version of the Standard machine; while the train of mechanism for automatic focusing did not look quite so tortuous.

In operation, the Junior was virtually the same as its Standard forerunner. Since albumen plates were still the vogue in 1930, a photographic positive (maximum size 8 × 10 inches) normally served as input to the machine with a mercury vapour tube as the illuminant behind. For sizing and squaring purposes, the positive was projected on to a glass screen at the front of the machine. Afterwards the screen was replaced by a darkslide loaded with a wet collodion plate. By manipulating the two controls provided, the photographic plate could be traversed horizontally and vertically to pre-determined positions within an accuracy of 0.002 inch and at each consecutive step an exposure by projection was made, monitored by an automatic time control. Enlargements up to twice the original size and reductions down to ⅔ constituted the range.

Once details of the 'Lithotex' Junior had been released to the trade, the orders began to build up steadily. In 1932 one of the most interesting installations occurred at J. Barnes & Son where the machine was utilised for the exacting job of stepping-up multi-coloured cotton reel tops. Tin printers figured prominently among the other early users, e.g. Hudson Scott & Co. Ltd of Carlisle and the Metal Box Co. Ltd at Palmers Green. The Junior machines were eventually to penetrate other specialised branches of the industry, such as the manufacture of nameplates and ceramic transfers, but the biggest users were security printers.

Non-technical readers may well query the apparent wastefulness of one type of machine for making multi-negatives and another for printing-down to lithographic plates. Equally the smallness of the maximum size of multi-negative from a 'Lithotex' Junior might seem a retrograde development relative to the bigger product of the earlier Standard machine.

The two issues are, in fact, interrelated. Exposures to bichromated-colloid coatings are measured in minutes rather than seconds, possibly 3 to 4 or more minutes, so that the repetition of a single *small* design over the area of a large machine plate would consume an inordinate amount of time, even in a step-and-repeat machine. Consequently, the idea of forming a multi-negative of a small design (as a prelude to platemaking) offered economies where rapid exposures could be timed in seconds. However, the maximum size of a glass or film negative that can be conveniently and efficiently handled is restricted even today, but more so in the past when wet collodion photography was employed. As the collodion plate dried, so its sensitivity decreased, while the soluble salts in the coating crystallised out to destroy the image. Therefore, the use of two types of step-and-repeat machine was considered appropriate for certain classes of work; primarily those involving small designs such as postage stamps, labels, etc. Contemporary printers still hold to the concept but, with advances in machine design, are frequently able to supply it in a more rational way.



Pictorial Machinery's publicity material of the 1930s went to great lengths to explain the policy when the 'Lithotex' Junior was introduced, as the ensuing extracts demonstrate. A 'Lithotex' Junior 'is a full brother to the Standard step-and-repeat machine. It will not deputise for the larger machine where large-size multi-negatives are required, but it will perfectly perform the functions of its bigger brother where multi-negatives

are required of small size . . . The functions of the 'Printex' Junior and 'Lithotex' Junior are quite separate, but the latter is complementary to the former for the economical reproduction of small designs . . . when a design smaller than $6\frac{1}{2} \times 8\frac{1}{2}$ inches is to be repeated over a large plate, it is not economical to use the 'Printex' Junior owing to the many and comparatively long exposures. This is where the 'Lithotex' Junior becomes an efficient and economical complementary machine.' Thus, by 1930, the parentage for a long series of 'Lithotex' and 'Printex' machines had been established.

'Printex' Minor Direct Mechanical Negative Printer

Dogged by economic depression, the graphic arts industry of the 1930s was scarcely buoyant and the minds of machinery suppliers were constantly exercised to alleviate the situation for printers and to remain in business themselves. One attempt by Pictorial Machinery to come to terms with the situation was embodied in the 'Printex' Minor Direct Mechanical Negative Printer, which has been described as a cheaper version of the 'Printex' Junior machine. Both machines had a maximum plate size of $42\frac{1}{2} \times 53\frac{1}{2}$ inches, though the actual printing areas of plates from the two machines differed slightly. Overall the Minor machine was of lighter construction than the Junior, being little more than half its weight. Even so, the Minor machine was sufficiently sturdy to preserve accuracy and was by no means a skimped device. It was also a compact machine occupying about half the floor area of the Junior.

To operate the Minor, a negative was fastened in a holder, squared-up on the register table of the machine, and clamped horizontally under the light box. Likewise, a metal plate coated with a light-sensitive colloid was mounted on the machine bed and protected from the daylight by pull-over blinds. Following correct positioning, the two were forced into pressure contact and an exposure completed. Afterwards the negative carrier was indexed to the next step by means of the traverse screw mechanism. In the Minor machine, the lithographic plate remained *stationary* and the negative only was indexed and traversed to the various steps, whereas with the Junior both the negative and plate were moved in turn.

Despite the general shortage of money and the escalation in the cost of the Junior machine, the printing industry did not take to the Minor design and preferred to pay extra for the more established model. Only one Minor machine was built and that went to Hubner's Ltd. It appears that the Minor had been still-born, the concept being ahead of its time as history was to show.

'Printex' Senior Direct Mechanical Negative Printer

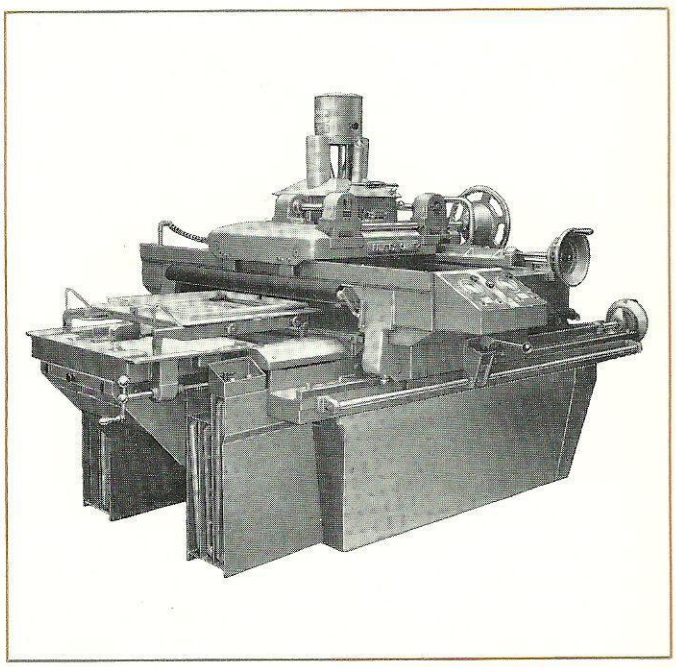
In 1938, the next step-and-repeat innovation was to emerge from Pictorial Machinery. It was a massive machine that reflected the growth of photolithography itself. Known as the 'Printex' Senior Direct Mechanical Negative Printer, the machine was simply an enlarged version of the 'Printex' Junior for exposing plates up to $54 \times 72\frac{1}{2}$ inches, a development necessary to match the expansion of lithographic presses. Some 15 Senior machines were sold between 1938 and 1959, the first users being Thomas Forman & Sons Ltd of Nottingham, Tillotsons (Liverpool) Ltd, and Mardon Son & Hall Ltd of Bristol. In principle and essential detail, the Senior worked in precisely the same manner as the smaller machine.

'Printex' Cadet Direct Mechanical Negative Printer

Once again, in 1952, Pictorial Machinery decided to build a cheaper and alternative machine to the 'Printex' Junior: a decision prompted by the increasing production costs of the Junior model and by the need to meet certain sectionalised needs within the printing industry. In essence, the project was a resurrection of the Minor machine concept of 20 years before. Quite naturally, the operational principles of the 1931 machine were adopted intact: that is, a negative-holder stepping above a stationary plate, but in other respects the 'Printex' Cadet had to be more elaborate to appeal to a more sophisticated market. It was doubtless a more accurate device than its 1931 progenitor with refinements like a ratchet lock giving positiveness to the lead-screw settings.

From the outset, the Cadet machine had to be more versatile and was conceived for a dual-purpose role. The basic design was a horizontal step-and-repeat machine for printing down to sensitised metal plates, but with an optional multi-negative attachment that could be brought into play when required. It accepted metal plates up to $42\frac{1}{2} \times 53\frac{1}{2}$ inches (as the Junior and Minor machines) and took negatives up to 16×20 inches. Integral with the machine was a register table with engraved cross-lines and striplights behind. An arc lamp was the light source for platemaking, while the multi-negative attachment included a filament lamp.

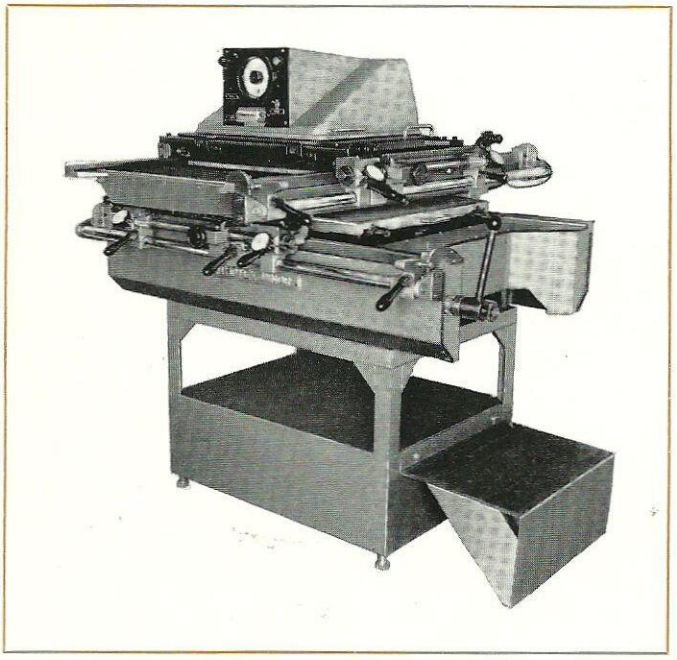
In contrast to the disappointment of 1931, the Cadet machine was warmly received by the printing industry. No less than two dozen machines were sold in its first year, while the period between 1953 and 1959 witnessed the delivery of at least one a month: the bumper year being 1955 which yielded more than two machines every month.



'Lithotex' Minor Step-and-Repeat Contact Negative Printer (Type 55)

Pictorial Machinery released details of another 'Lithotex' machine at IPEX 1955: the Minor Step-and-Repeat Contact Negative Printer which is still in production. More than 50 of these machines are now in the field.

A 'Lithotex' Minor, though perpetuating the family name of the earlier Standard and Junior machines, owes little to them from the technical standpoint: the one common factor being that all three machines were designed for making multiple negatives or positives. However, the two earlier machines functioned on projection principles that enabled them to enlarge or reduce the master subject, whereas the Minor machine is a contact printer and can reproduce designs at same-size only. Moreover, the



projection style of the Standard and Junior machines warranted a vertical design, whereas the Minor model, involving pressure contact, is horizontal and emanates more from the 'Printex' machine mould. The photographic film or glass plate is mounted on the machine bed of the Minor and, once locked in position, it remains static while the unit positive or negative is stepped above it for consecutive exposures. Control is by dial gauges and steps with an accuracy of 0.001 inch.

The capacity of the Minor machine extends to multiple negatives and positives up to 20 × 24 inches. Additionally a special lithographic plate attachment, incorporating a mercury vapour lamp, can be fitted for printing-down to small-offset surfaces. Like all previous machines by Pictorial Machinery, the accuracy of the Minor is guaranteed, while quality-control devices developed over the years have become standard fitments.

'Lithoprintex' Junior and Senior Step-and-Repeat Machine (Types 57 and 54)

In 1955, Pictorial Machinery was taken over by The Monotype Corporation Ltd, an association that concentrated certain mutual interests which were to add a new dimension to step-and-repeat machine design and establish new criteria of accuracy. At the time of the merger, the Corporation was manufacturing at its Salfords factory a 'Monotype' Universal Process Machine which, like the 'Lithotex' Minor, had been introduced at IPEX 1955. To rationalise the group's activities and to harness the newly-acquired know-how, Pictorial Machinery assumed responsibility for the Universal Process Machine which became a 'Lithoprintex' Junior Step-and-Repeat Machine, the first successful British-built vertical step-and-repeat machine.

The original name of Universal was quite apt, since the machine could expose to multiple negatives or positives and lithographic plates, as well as scribe lines on developed negatives. In view of this last facility it is interesting to see that one of the first users of a 'Lithoprintex' Junior machine was H. W. Peel & Co. Ltd, the graph paper printers.

By inheriting the Universal Process Machine, Pictorial Machinery now had access to the most precise registration system ever invented for stepping-and-repeating. It was to mature in a range of 'Lithoprintex' machines. All of these machines are of the vertical pattern consisting essentially of an upright platen on which the sensitised work material (metal, glass, or film) is held perfectly flat by a rear vacuum. In front of the platen, the unit design is fastened in a holder for stepping vertically and horizontally over the work area. For the repeated exposures, the unit design and work material are held in contact by a front vacuum, thereby overcoming the need for pressure contact that proved to be one of the stumbling blocks in the gigantic and vertical 'Printex' Mechanical Negative Printer of 1925.

The 'Lithoprintex' machines utilise a system of notch bars and micrometer screws for both the vertical and horizontal traverses, to allow a fine setting to 0.0005 inch. Notch bars, with their intrinsic advantages, were bound to dislodge the lead-screw mechanisms that had been applied so effectively by Pictorial Machinery for 35 or more years, and the new system was to enhance the company's reputation for precision. Notch bars bestow many benefits. First, the bars may be constructed more accurately than lead screws. They are built in sections of 6 inches and any error may be isolated and the defective section rejected. Hence, the danger of a cumulative error occurring unchecked is eliminated. Secondly, the notch bars are less susceptible to wear than a lead screw, since the unit-holder is moved on a rack and pinion: the notches simply serving to lock the holder in position.

In practice, the notch bars are used to set the unit-holder to the full inch position, while the ground-steel micrometer screws provide fractional-inch settings down to 0.0005 inch. In the early days of step-and-repeat work, the 0.002 inch *repetition accuracy* guaranteed by Pictorial Machinery constituted an enormous stride forward, but as time passed and markets became more sophisticated, so machinery standards had to change to keep pace. On previous pages, the diverse applications of 'Lithotex' and 'Printex' machines have been mentioned, but a new and more critical market was to emerge for 'Lithoprintex' machines where the accuracy tolerances became even finer. This market was to be printed circuit production, a field in

which 'Lithoprintex' machines have gained a unique reputation.

For general printing applications, the essential requirement is *repetition accuracy*, whereby the multiple images on negatives, positives, and plates fit accurately for the registration of successive colour workings. Thus, a *minimal* cumulative error across a work surface will not be catastrophic, since it will recur on every plate and the finished polychromatic print will come out in good register. Where printed circuit production is concerned, the coincidence of colours does not arise, but each image must be positioned accurately in relation to the whole and one to another. Here *absolute accuracy*, rather than *repetition accuracy*, is wanted. By the notch-bar system the former can be more nearly approached than with lead screws.

Two types of illuminants are available with 'Lithoprintex' machines, both fitted with hoods to confine the light to the exposure area. A pulsed-xenon lamp or an arc lamp serves for lithographic platemaking and a tungsten-filament lamp for multi-negative and positive work. Displays and controls for the operator include vacuum gauges and an exposure timer; while a light-integrating meter is a standard part of the equipment when using a carbon-arc light source.

Differences between the 'Lithoprintex' Junior and Senior machines relate purely to capacity; their operating principles are identical. Maximum exposure area on the Junior machine is 35×47 inches as opposed to 57×78 inches on the Senior, while a similar disparity exists between the sizes of the respective unit designs that can be loaded: 16×20 inches and 28×32 inches.

As previously stated, the 'Lithoprintex' Junior machine as launched in 1956 was essentially a legitimate copy of a 'Monotype' Universal Process Machine and it undertook the three functions of the original. Eight years later, an improved version of the machine was designed. Scribing was dropped from the Mark 2 model which forfeited the universal tag, though still having a dual-purpose multi-negative/positive and platemaking capability. Introduction of the Senior model occurred in 1960 and even greater success attended the venture with sales currently running virtually parallel to those of the Junior, despite a shorter period on the market.

'Autoprintex' and 'Motoprintex' Machines (Types 59 and 60)

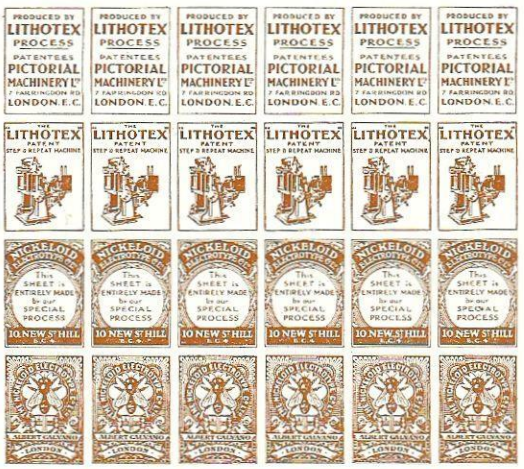
Automation and mechanisation of production techniques have commanded increasing attention in the printing industry over the past decade, so much so that Pictorial Machinery decided to investigate their feasibility in step-and-repeat work and to examine market potential. As a result, the 'Autoprintex' and 'Motoprintex' machines were launched at DRUPA 1967. Both machines will expose work up to an area of 64×81 inches from subjects up to 24×24 inches.

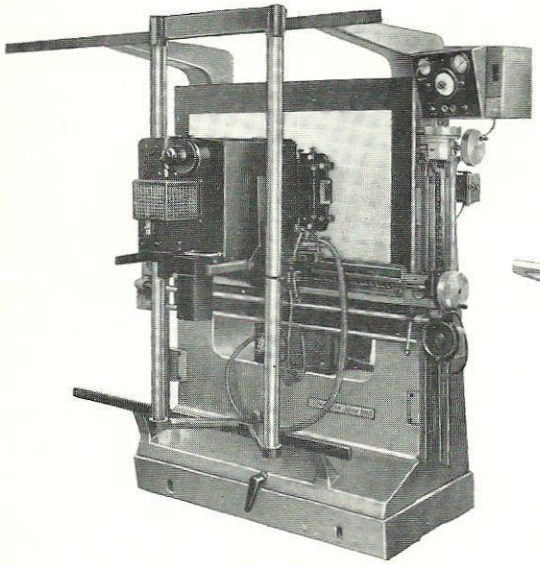
Like the 'Lithoprintex' series, both of these machines embody an upright platen to which the work material is attached by vacuum. Additionally the platen incorporates a series of register points for affixing plates in a colour set successively to the same datum points: a special unit being supplied with the machines for punching the locating holes in the work material to implement the registration system. Movement of the unit-holder to stepped positions in front of the machine platen is effected by 'Rotax' recirculating ball screws. These screws are hardened and ground to a high degree of precision. In operation they are virtually free of friction and backlash so that they have a long working life of constant accuracy.

The fundamental difference between the 'Autoprintex' and 'Motoprintex' machines relates to the method by which the unit-holder is moved and controlled. On the 'Autoprintex' model, a punched plastic tape – coded with information for the successive vertical and horizontal positions of the unit-holder – provides input to the machine. Fluid logic and electro-pneumatic controls are employed to read the information and to convey the movements to the unit-holder automatically. Automation does not suit all classes of work, but where the work flow reaches sizeable proportions and consists of jobs with a reasonable number of identical images arranged in regular steps, an 'Autoprintex' machine offers the opportunity to eliminate production bottlenecks. Consequently, 'Autoprintex' machines will tend to find support in the fields of lithographic packaging work and of security printing.

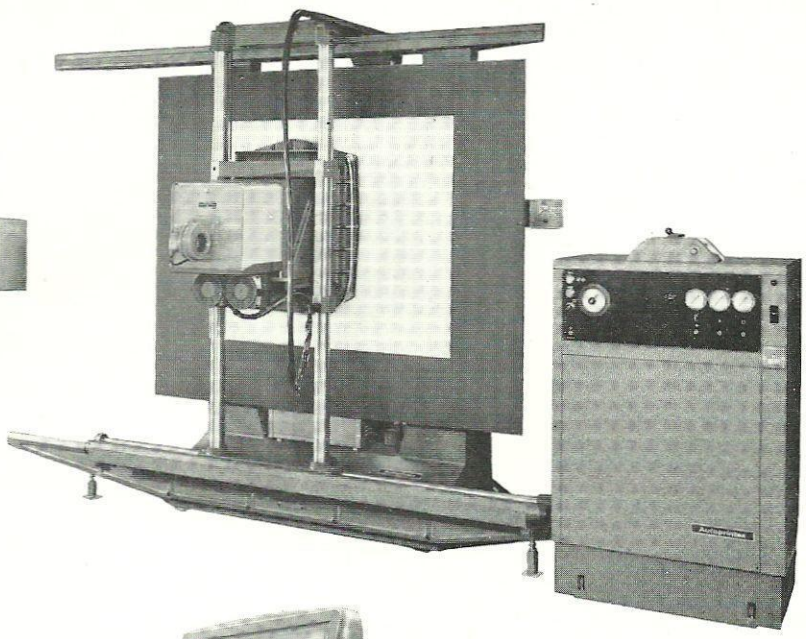
On a 'Motoprintex' machine, the movements of the unit-holder are fully motorised and controlled from a single console. Unlike the automatic machine, the 'Motoprintex' excels on less straightforward work, such as subjects with interlocking images or turn-rounds.

By developing the 'Autoprintex' machine, Pictorial Machinery have maintained their long history of innovation in the step-and-repeat field. It is the first European-built vertical machine to be automatically controlled, while the use of fluid logic introduces a new level of reliability. It is yet another milestone in 50 years of pioneer work, during which more than 725 step-and-repeat machines have been built by the company, about two-thirds of them being supplied after the Second World War. A proud record and one that will be jealously guarded in the future.

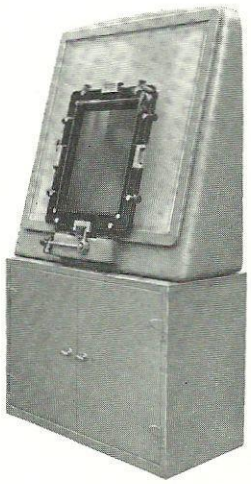




▲ 'Lithoprintex' Junior Step-and-Repeat Machine Type 57

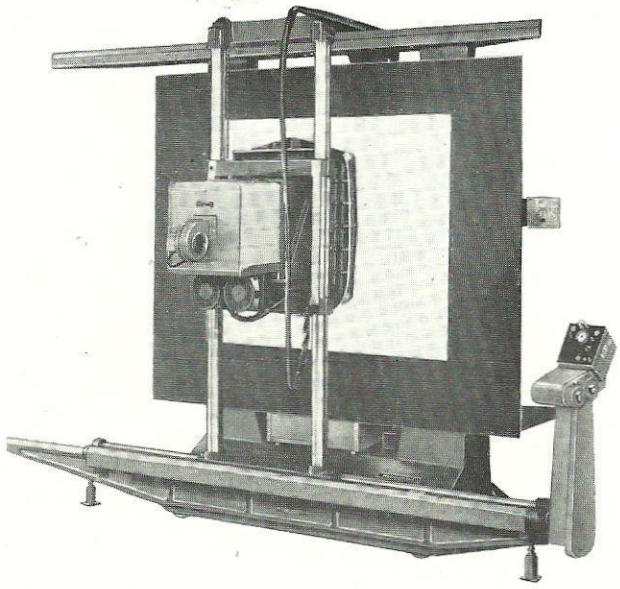


▲ 'Autoprintex' Step-and-Repeat Machine Type 59

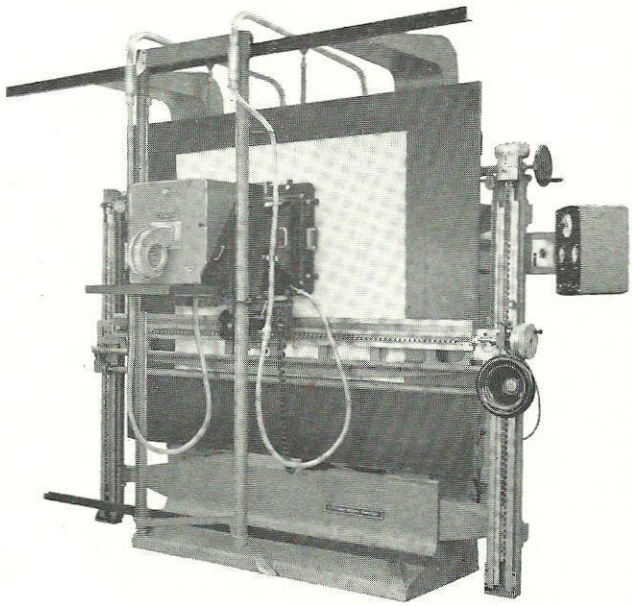


◀ Register device for step-and-repeat machines

▼ 'Motoprintex' Step-and-Repeat Machine Type 60



▼ 'Lithoprintex' Senior Step-and-Repeat Machine Type 54



Printing-down Equipment

From its founding in 1919, Pictorial Machinery attempted to sell to printers a package of equipment consisting of a 'Lithotex' Standard Auto-Focus Step-and-Repeat Machine, a 'Lithotex' Patented Printing-down Frame, and, to photogravure textile printers only, a Rotary Transfer Machine. Within a comparatively short time, the overwhelming market resistance to a package deal was soon realised, and in November 1920 the company announced that 'it has now been decided to sell these items separately'.

'Lithotex' Standard Printing-down Frames

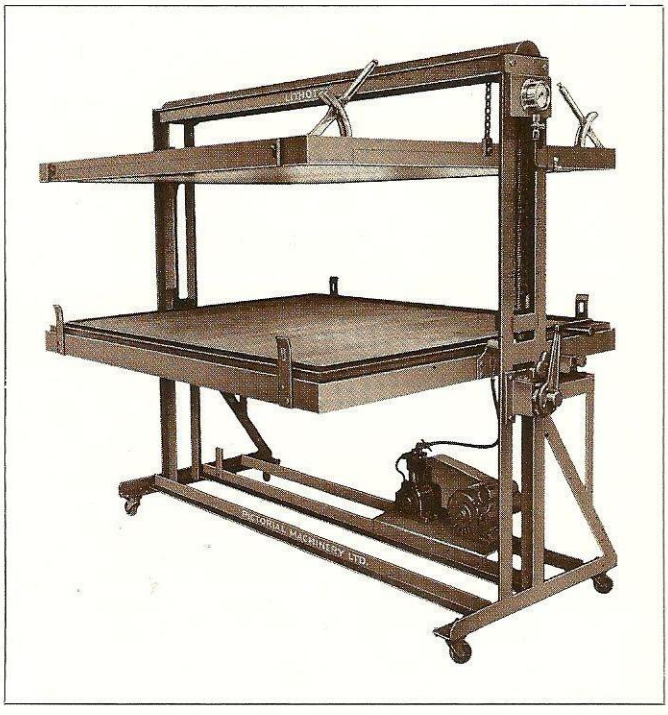
Two models of the printing-down frame were specified for taking plates up to 40 × 60 inches and 30 × 40 inches respectively. The earliest equipment seems to have started out as 'Lithotex' Patented Printing-down Frames to become 'Lithotex' Exhibition Model Printing-down Frames (perhaps for 1925 only) and to end up as 'Lithotex' Standard Printing-down Frames; the last name prevailed until 1955 when the model was withdrawn from production. All three names are really synonymous, though each change may have been accompanied by small modifications.

Some vacuum-pressure 'Lithotex' wooden frames were half-heartedly brought out by Pictorial Machinery in 1922 to combat trade recession, but right from the beginning the company had been dedicated to the philosophy that precision in photomechanical work must be based on rigid machine construction. Accordingly the first vigorously promoted 'Lithotex' printing-down frames were of fabricated and welded angle-iron and incorporated provision for vacuum to contact the negative and machine plate. This kind of innovation must have appeared remarkable to an industry not unaccustomed to wooden frames employing straightforward physical pressure.

In essence, a 'Lithotex' Standard frame consisted of a baseboard surmounted by a rubber blanket on to which the plate and negative were laid in contact. Access to the baseboard when horizontal for loading could be achieved from all four sides. Parallel to the baseboard was a sheet of plate glass mounted in a metal framework on shock-absorbing buffers which, for loading, was lifted clear by overhead gear, thereby enabling the operator to reach the work by ducking beneath the glass. When loading had been completed, the glass lid was lowered from a single-winding control and clamped to the baseboard for the application of vacuum. Incidentally, the clamping could be carried out from one end of the frame, a unique feature in the early days when competitive products necessitated the operator walking all round the frame to accomplish the same result. For exposure purposes, the Standard frame was swung to a vertical position facing an arc lamp.

Another innovation by Pictorial Machinery were the spring-loaded four-way masking blinds that allowed the fringes of a plate to be shielded from the printing-down light source: a matter of significance in the 1920s when the negative-working albumen process was a commonplace. In lieu of masking blinds, the edges of the plate had to be protected by tinfoil or paper placed around the negative. Masking blinds receded in importance with the onset of positive-working plate processes, such as deep-etch.

About 1925 a vacuum gauge, absent from previous models, was included in the equipment, while publicity material in the same year quotes two sizes of frames for plates of 48½ × 65 inches



and 38½ × 45 inches, both larger than the known 1920 specification. Eight years later an intermediate model was introduced for plates up to 42½ × 53½ inches, and this incorporated a more efficient vacuum pump motor and a safety catch or pawl for the lifting mechanism. The latter was a marked improvement that counteracted the tendency of some careless operators to allow the glass top to run down freely from an elevated position with

the attendant danger of its crashing into the work table. It also ensured that the glass was held securely in any raised position.

For the exact locating of successive exposures on a plate in a printing-down frame, the purchase of 'Lithotex' equipment automatically entitled the printer to use the Developed Lay-Mark System which appears to have been protected by patent. It seems incredible to the modern mind that such a method could have been protected (even when wrapped up amongst other specifications), but one must bear in mind that in the 1920s the photomechanical processes had scarcely emerged from the embryonic stages. Briefly the method consisted of drawing four lay or register marks on the corners of an original. When the work was photographed, the lay marks were duly recorded on the negative and could be used as guides for printing-down successive images. After the exposure of a negative to a coated metal plate, the image and lay marks were faintly visible. Accordingly, the lay marks (not the subject) required for the positioning of adjacent images were made stronger by inking up and by developing out with a little moisture, so that the negatives for subsequent exposures could be registered to them. Finally, after the processing of the entire plate and before the press run, the lay marks were removed from the metal surface.

Once the Standard frame had been divorced from a larger equipment package to become available as a separate item, the success of the equipment seems to have been immediate. By 1925 some 250 frames had been installed in commercial plants, and before being discontinued in 1955 over 1,500 frames had been sold.

Perhaps the most publicised and interesting use of one of these frames occurred at J. Robertson & Co. Ltd of St Annes-on-Sea who, in 1922, produced *The Blackpool Times* by offset-photolithography, a prophetic gesture in view of the current trend towards web-offset newspaper production. F. T. Corkett quite clearly found the development at *The Blackpool Times* enormously stimulating and the uncanny foresight possessed by the man was to be displayed in a few predictions prompted by the venture. In *The Newspaper World* of 4 February 1922, under a heading 'Photo-Litho for News Work', he suggested that the newspaper of the future would be 'printed in more than one colour – in two, at any rate'. Elsewhere in the article appeared the comment that the 'photo-litho newspaper of the future will be much more largely illustrated'. Both of these viewpoints have been adequately confirmed by current web-offset weeklies and evenings. In a later article in *The Newspaper World* of 21 March 1925, he forecast little application for photolithography in daily newspapers, but recognised the relevance of the process to weeklies and supplements. Contained in the same article was the prediction that book reprints would be undertaken increasingly by photolithography, a growing practice nowadays in countless book houses. Yet another insight into the extraordinary perspicacity of the man occurred in an advertisement for Pictorial Machinery in *The Newspaper World* of 1923. On this occasion F.T.C. (the signatory of the advertisement) pleaded the case for photogravure inserts to newspapers, and the practicability of the scheme has been verified by contemporary full-page colour advertisements in the national dailies.

'Lithotex' Model X Printing-down Frame (Types 61, 62, 63, 64 and 65)

In 1955 the Standard frame was superseded by a 'Lithotex' Model X Printing-down Frame available in five different sizes for accommodating plates up to $43\frac{1}{2} \times 50$, $47\frac{1}{2} \times 58\frac{1}{2}$, $53\frac{1}{2} \times 70$, $53\frac{1}{2} \times 73$ and 50×100 inches respectively. As with its forerunner, the glass cover and baseboard separate horizontally and in parallel for loading, but on robust scissor arms instead of the erstwhile overhead lifting gear. Such a design enables the operator to reach the work from all four sides and avoids the limited access of frames that open book-fashion. Clamping of the Model X frame in four places is automatically achieved from a central point. Additionally the whole unit is counterbalanced for holding at any angle to facilitate work inspection. Exposure may be performed in the vertical or horizontal position. Nearly 300 installations have so far been completed and the frame represents one of the most popular products currently marketed by Pictorial Machinery.

'Lithotex' Bench Vacuum Frames (Types 69, 70 and 71)

The Standard frames appealed primarily to photolithographers, especially those with larger printing presses; but for process engravers and others with smaller work requirements they were a trifle lavish. To gain greater market coverage and penetration, Pictorial Machinery launched a 'Lithotex' Process Vacuum Frame in 1927 for plates up to 20×24 inches.

From the outset, this frame was intended for mounting and operating on a work bench, though a tubular welded steel stand mounted on castors was later supplied if required. At first the base of the frame was a light metal fabrication, but by the end of the year two solid side castings had been substituted. Originally the vacuum-pump was driven by a motor, bolted to the floor either alongside or beneath the bench. Later a hand pump was attached to the outside of the framework as an alternative to the motorised system. Loading of the negative and metal plate was performed with the frame in the horizontal position, but for exposure the frame could remain horizontal or be swung to the vertical opposite the printing-down light source. The glass lid was hinged to the base of the frame.

In the 1930s the range of 'Lithotex' Process Vacuum Frames was extended to two models. The original size of 20×24 inches continued, but a smaller version for plates up to 16×20 inches was offered. Later a third and bigger model came on to the market for plates up to 26×32 inches. In a leaflet entitled 'The frame of many uses', the equipment was commended to process engravers 'for reversal negative or positive printing' in darkrooms, the last-named technique probably gaining in volume with the onset of deep-etch methods in photolithography. The leaflet goes on to suggest other applications of the frame 'as an original holder for a process camera or as a negative plateholder in conjunction with a darkroom camera'.

Nearly 600 'Lithotex' Process Vacuum Frames were sold between 1927 and 1962 when they were superseded by the current 'Lithotex' Bench Vacuum Frames (Types 69, 70 and 71) for plates of 16×20, 22×26 and 26×32 inches, these three models bringing the cumulative total of sales for the entire

series to well over 800. Incidentally, the Types 69, 70 and 71 frames all have motorised vacuum systems, the manual pumps having been discarded from their inception.

'Lithotex' 4-Frame Exposure Cabinet (Type 74)

In 1929 a patent application was made for a 'printing cabinet'. In essence, the unit in those days comprised four 'Lithotex' process frames arranged to form the sides of a square around a central light source, the whole assembly being integrated into a tall cabinet structure and allowing four plates to be exposed simultaneously. Designed to speed up printing to metal, the unit caused quite a stir in the trade press. *The Modern Lithographer and Offset Printer* of April 1929 greeted the unit as a 'method of systematising the actual exposure for small size work – particularly photoengraving – and should undoubtedly prove an efficient and economical introduction to any process and photolitho establishment'. And so it has proved to be.

Any unit that purports to accelerate production methods immediately commands the attention of newspaper offices and a 'Lithotex' Exposure Cabinet was no exception. In March 1930, Pictorial Machinery took advertising space in a supplement to the *Daily Herald* indicating that that newspaper had installed what was described as a 'Lithotex' Process Frame Arc Cabinet.

In 1946 a more modern and efficient derivative from the original unit was announced as a 'Lithotex' 4-Frame Exposure Cabinet, which was superseded in 1961 by an improved version. The present model is more compact and squat than its tall forebear, while the internal design of the cabinet incorporates an ingenious reflector system that ensures uniform coverage of the four frames by the 1,000-watt high-intensity mercury vapour tube. About 50 of the modern series of cabinets are operative in the field.

'Lithotex' FSM Printing-down Frames (Types 66, 67, and 68)

In 1940, Pictorial Machinery developed a new class of printing-down frame, known as the FSM type, especially for installation in army mobile survey vehicles, the initials standing for Field Service Model. As one might expect, the early FSM frames were of compact and robust design.

Having proved their validity under military conditions, the relevance of the FSM frames to the activities of civilian printing offices was soon recognised. In 1947, an improved version of the equipment was offered in three maximum-plate sizes of $26 \times 26\frac{1}{2}$, 31×37 and 34×40 inches. Briefly the FSM units consisted of two side frames joined at the base by a sturdy compartment enclosing a motorised exhaust unit. From the top of the side frames, the actual printing-down assembly was pivoted. It opened book-fashion for horizontal loading and was counterbalanced at the back for stabilisation in both the vertical and horizontal positions. When in the vertical position, the printing-down unit stood between the side frames and above the base compartment.

Again, in 1961, the FSM frames underwent improvement, though staying unchanged in principle. They are currently known as 'Lithotex' Printing-down Frames (FSM Mark 2, Types 66, 67 and 68) and either face-up or face-down models can be provided. Many refinements for speedy and reliable operation have been incorporated, such as a neat spring counterbalancing system underneath the frame, and a modified clamping device. Nearly 350 installations of FSM frames have been manufactured.

'Lithotex' Face-down Printing Frames

Before the 1939–45 war, Pictorial Machinery built two models of face-down vacuum frames. For the non-technical reader, a face-down frame has the glass section as the base upon which the work is loaded, the rubber-blanketed section forming part of the hinged lid. That is exactly opposite to the face-up frames discussed hitherto. Photogravure printers have traditionally provided the biggest outlet for the face-down vacuum frame, the horizontal and stable glass sheet providing a convenient surface on which to assemble or plan positives and to cover them with a sheet of carbon tissue for exposure. A 'Lithotex' Photogravure Face-down Bench Frame was constructed in the three sizes of 16×20, 20×24 and 24×24 inches. Hand or motorised exhaust systems were offered.

Concurrent with the photogravure model was another face-down frame of sturdy construction, known as a 'Lithotex' All-metal Vacuum Frame. It was made in five sizes, stood on a welded metal support, incorporated no less than eight spring clips for sealing the frame, and had a power exhaust unit. In 1940 the fixed metal stand was replaced by a collapsible design for quick dismantling and was fitted with three wheels. It received a WO tag (the initials standing for War Office) and was intended for use by semi-permanent survey printing units in tropical areas, the frame being wheeled out into the open for exposure to the sun! After the war, the collapsible-base model was made available for civilian use and lasted until 1951, but it never achieved much popularity.

Regal Printing-down Frame

Before the successful promotion of the Model X Frame in 1955, Pictorial Machinery had become aware of the archaic appearance of the Standard frame and, for a replacement, attempted to jump several steps ahead with a Regal Printing-down Frame in 1953. It was a machine with a sleek modernistic look and technically blazed a trail as the first European-built vacuum frame to have motorised operation. It was made in three sizes: $38\frac{1}{2} \times 45$, $42\frac{1}{2} \times 53\frac{1}{2}$ and $48\frac{1}{2} \times 65$ inches.

The novelty in the design related to the motorised opening and closing of the frame, the glass top being elevated and lowered parallel to the horizontal work table without manual effort. Many safety precautions and production aids were built into the unit, but the venture came to an abrupt end in 1955 having failed to gain a broad acceptance. In concept, the Regal frame was ahead of its time, but it opened up possible paths for future development. Nonetheless, the enterprise underlined the fact that innovation does not always pay.

'Lithotex' Twin-Frame Printing-down Unit (Type 77)

In 1968, Pictorial Machinery extended its range of printing-down equipment by bringing out a 'Lithotex' Twin-Frame Unit,

a device designed to allow continuous printing-down of plates up to 32 × 42 inches. It consists of a double-sided frame, centrally pivoted on precision ball-races, with two independent vacuum systems operating from a single exhaust pump. During exposure, the loaded frame faces downwards on to a 4,000-watt pulsed-xenon lamp mounted internally to the unit. Thus, the upper frame may be loaded while the lower one is being exposed; the system is commonly referred to as 'flip-top'. The frames open book-fashion for loading and a single-action clamp ensures a perfect seal on closure. Once loaded, the frame may be rotated into the exposure position to be secured automatically by a locking catch. The flip-top system offers numerous benefits to printers, such as greater productivity, a saving in floor space (the light source being integral with the unit), and a more congenial working environment free from extraneous light and unwanted byproducts from the light source.

'Lithotex' Whirlers (Types 548a, b and c)

The first press reference to a whirler produced by Pictorial Machinery occurs in a full page advertisement in the July 1924 issue of the *Modern Lithographer*. It was mentioned by name only as a 'Pictograph' Whirler, and in the following year it appeared in *The British Printer* as a 'Pictograph' Sensitising, Developing, Washing, and Drying Machine. Soon afterwards it was renamed a 'Lithotex' Super Whirler and later still as a 'Lithotex' Plate Coating and Developing Machine.

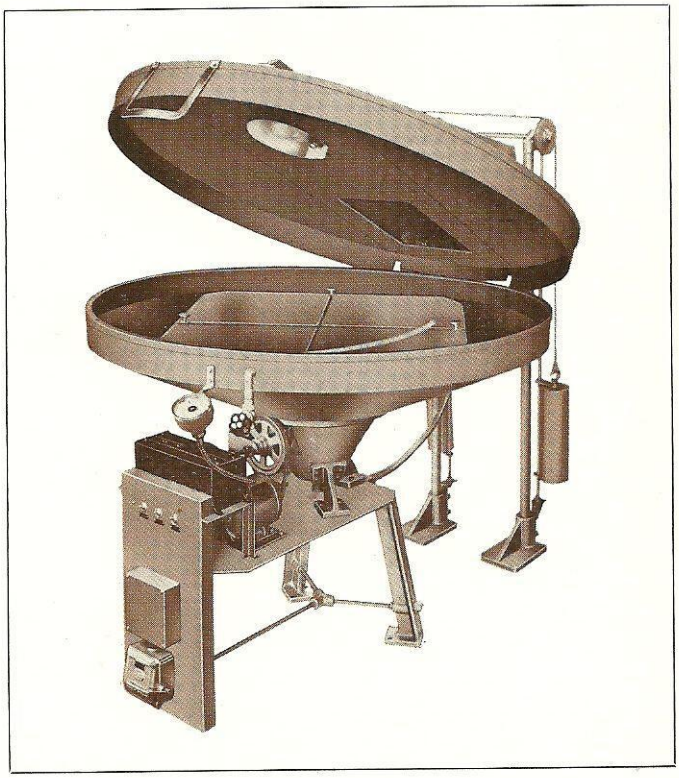
According to the announcement and illustration in *The British Printer*, the whirler consisted of an enclosed shallow circular tray, mounted on a stand, with a variable-speed motor beneath for driving the plate turntable at pre-determined speeds. Surmounting the unit was a lid containing an electric fan and heating elements, together with an elaborate overhead counterbalancing gear of chains running over large pulleys. Additionally the machine was fully piped for conducting away effluents to the drains and for receiving water necessary to wash off plates. The illustration in *The British Printer* shows a fixture on the lid of the whirler in which a funnel stood for conveying the coating solution through to the plate. In other words, the turntable carrying the plate was set in motion, the lid closed, and then the coating solution poured through a hole in the lid by way of a funnel.

Not surprisingly, the odd practice of pouring sensitising solution through a hole in the lid of the whirler did not survive for long and a swing-over coating arm had been substituted by 1925. At that time, a 'Lithotex' Super Whirler was in the vanguard of photomechanical development. It had a number of important characteristics, including: (1) the variable-speed motor for precisely determining the turntable speed; (2) a riveted and welded water-tight metal surround with a drain outlet that eliminated the need for a sink; (3) a self-centring swing-over coating arm; (4) a hot-air drying system; (5) a counterbalanced metal lid with chain lifting gear; (6) an evenly-supporting mesh turntable that avoided distortion to plates by bar marks not unfamiliar with other whirlers at that time; and (7) a nickel-plated swing-over arm as a water inlet for washing and developing plates.

To the modern workman these features do not seem particularly remarkable, but in 1925 they represented a great leap forward. Not an inconsiderable number of whirlers at that time were of an open skeleton structure, so that the centrifugal force generated by the whirling action sprayed the coating solution beyond the edges of the plate into the workshop. Heating was not uncommonly applied by gas jets underneath the plate, or sometimes the coated plate was flipped over on its turntable and spun face-down above the gas jets. Other whirlers had electric elements mounted in their lids for radiant heat drying. Moreover, in 1925, hand whirlers were to be found in numbers at least equal to those of the motorised pattern.

Leslie Linzell (as technical development director of Pictorial Machinery) did some plain speaking on whirlers at a meeting of printers in London in 1931. His remarks give an insight into the progress of whirler design of that time. He stated that 'a few years ago a whirler was looked on as a sort of five-barred gate on which to hang a plate, and so long as it turned round and had a heater of sorts no further notice was taken . . . practically all modern whirlers have electric driers, and nearly all have motor drives and variable speeds. Most of them have heating from the top, because if you heat underneath the zinc plate it may start coagulation in the grain of the plate. A plate to all appearances perfectly clean may be sent out to the machine, and after a few hundred runs pick up scum for no apparent reason. If . . . little particles of hard-boiled egg' (reference to the albumen platemaking process) are trapped 'in the grain of the plate the etch is unable to get down. The plate runs well until one of these little particles lets go and then there is bare metal to receive a transfer of ink.'

In 1925, a 'Lithotex' Super Whirler added to Pictorial



Machinery's reputation for innovation on at least three counts. It was the first machine to employ warm-air drying as opposed to the radiant heat elements in the lids of competitive products. It was one of the first machines to be fitted with an infinitely variable-speed electric drive. And it was one of the first machines to recognise the importance of supporting a plate evenly and rigidly to avoid distortion. Three sizes of whirlers were marketed, taking plates up to $48\frac{1}{2} \times 65$, $42\frac{1}{2} \times 53\frac{1}{2}$ and $38\frac{1}{2} \times 45$ inches.

Soon after 1933 the name of the machine was changed to a 'Lithotex' Patented Plate Coating and Developing Machine, a change that was accompanied by a number of significant technical refinements. All controls for operating the whirlers were now centralised on an improved version of the coating arm; a worm-drive had been substituted for the earlier friction type; and the ventilation in the lid for the drying system was made more compact and efficient.

Great prominence was given in a sales leaflet to the coating arm, yet this kind of device has never really gained popularity in the industry, the operatives always preferring to pour coating solution on to the plate from a teapot, beaker, or similar vessel. They have tended to be distrustful of coating arms because of the air bubbles that can occur from their use, thereby blemishing the evenness of the coating. In fact, the coating arm itself is rarely to blame, the trouble most usually arising from incorrect usage such as the failure to prime the device with solution before application to the plate. Irrespective, however, of the method of applying the solution, an operative always wants to see the plate being coated, which must explain why the earlier method of pouring through a hole in the closed lid was abandoned.

Few other changes occurred in the design of this whirler from the middle 1930s until its withdrawal from production in 1961, though the controls on the coating arm were simplified and a plate illumination system and cowl were later built into the lid. Over 1,000 of the original 'Lithotex' whirlers were constructed.

'Lithotex' Whirlers (Types 119, 120 and 121)

In 1961, 'Lithotex' Whirlers (Types 119, 120 and 121) superseded the 548 design, and these have proved highly successful. They accommodate plates up to 33×41, 45×57 and 54×72 inches respectively to cater for the most popular offset machine sizes, though they are employed by photoengravers as well. Perpetuated in the modern design is the method of warm-air drying, but with a refinement allowing the temperature to be regulated to suit different types of coatings. Additionally, the air drawn into the system is more effectively filtered. The streamlined machine design promotes cleanliness of working by obviating recesses and corners where waste materials might accumulate, while the drain outlet is situated to the rear of the machine to permit ease of access.

Controls for operating the whirler are centralised on a free-standing console. Constant speed of the turntable – once it has been selected – is ensured by the use of a direct-current motor operated by means of a rectifier from alternating-current mains: a refinement that adds to the cost of the machine, but one that is adequately justified by the uniformity of the coatings resulting from the accuracy of the control.

'Lithotex' Whirlers (Types A1458 and B201)

In 1938, Pictorial Machinery entered the market with two smaller whirlers, both derivatives from the earlier 548 design. Of the two, the type B201 was the bigger, accepting plates up to $30\frac{1}{2} \times 37\frac{1}{2}$ inches, and was the closest in appearance to the 548 machine, even to the point of including a miniaturised chain counterbalancing gear for the lid. On the other hand, the type A1458 whirler took smaller plates up to $26\frac{1}{2} \times 26\frac{1}{2}$ inches and had a less obtrusive counterbalance, which ran across the back of the machine and dispensed with the chain gear. Both whirlers incorporated neat operating panels, warm-air drying, swing-over water arms, and were of compact design. It was the latter characteristic that made them suitable for inclusion in the mobile survey vehicles used by the army during the 1939–45 war. About 325 of these whirlers were manufactured and sold before being replaced in 1961 by the current 'Lithotex' Whirler (Type 116).

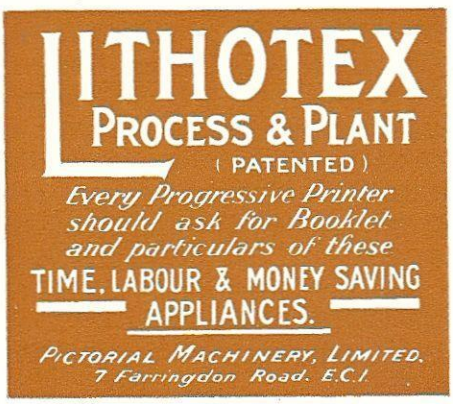
'Lithotex' Whirler (Type 116)

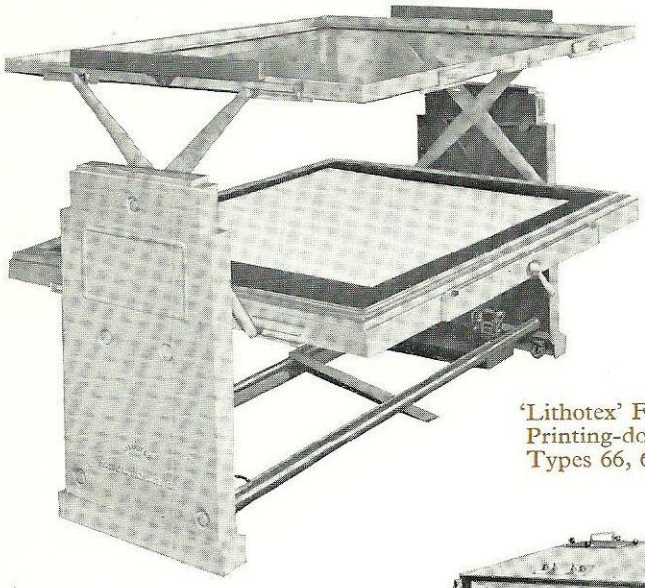
'Lithotex' Whirlers (Type 116) will coat plates up to 24×30 inches. They have a speed control variable between 0 and 400 r.p.m., the higher speeds being especially appropriate to photoengravings where coating solutions of greater viscosity are employed. Normally the bigger 119, 120 and 121 whirlers have a top speed of 175 r.p.m. which is more than enough for photolithography, but a wider speed range for photoengraving can be supplied with these machines if required. Warm-air drying is a standard feature of the Type 116 machine, as is a swing-over water arm. There are over 130 installations of these machines.

'Lithotex' Bench Model Whirlers

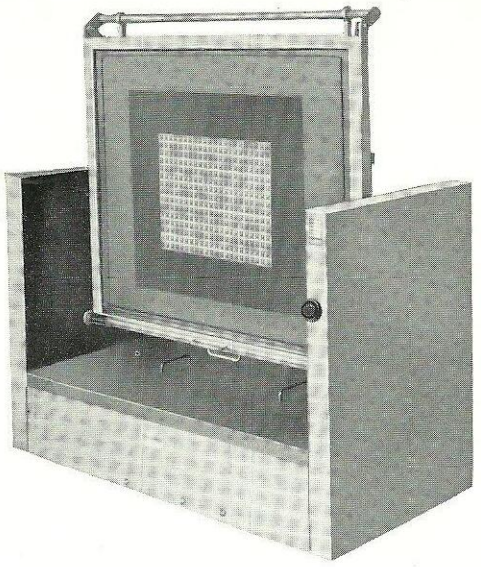
Towards the close of the 1920s, Pictorial Machinery determined to make some impact on the photoengraving trade, having previously concentrated on the photolithography and photogravure markets. Their policy became manifest in a 'Lithotex' Bench Vacuum Frame of 1927 and in a 'Lithotex' Exposure Cabinet of 1929. It received further impetus in 1930 with a 'Lithotex' Bench Whirler noted in the technical press of that time as 'a hand whirler of especial interest to the smaller process engraver'.

Various other whirlers were produced by Pictorial Machinery, notably a 'Lithotex' Minimus Plate-Coating Machine, that seems to have been included originally as part of a small-offset equipment package in 1938.

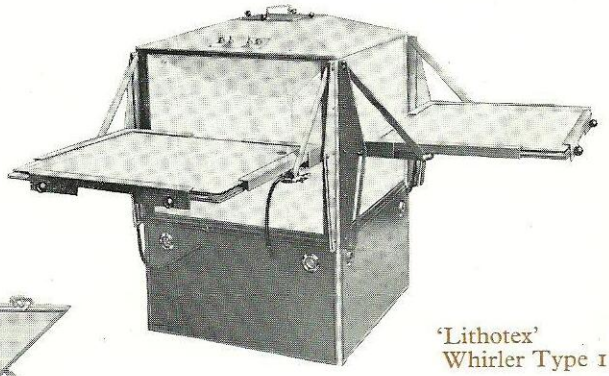




'Lithotex' FSM
Printing-down Frame
Types 66, 67, 68

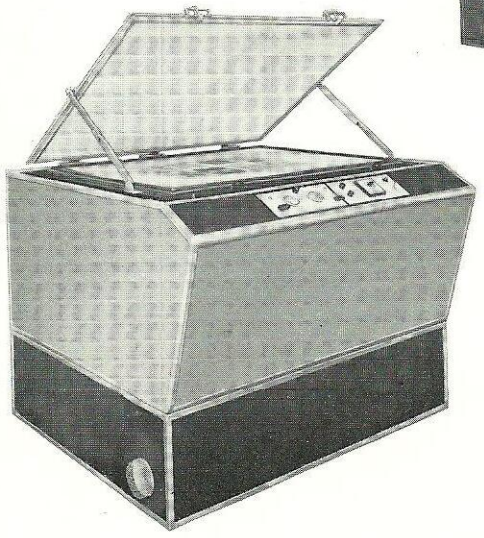


▲ 'Lithotex' Model X
Printing-down Frame
Types 61, 62, 63

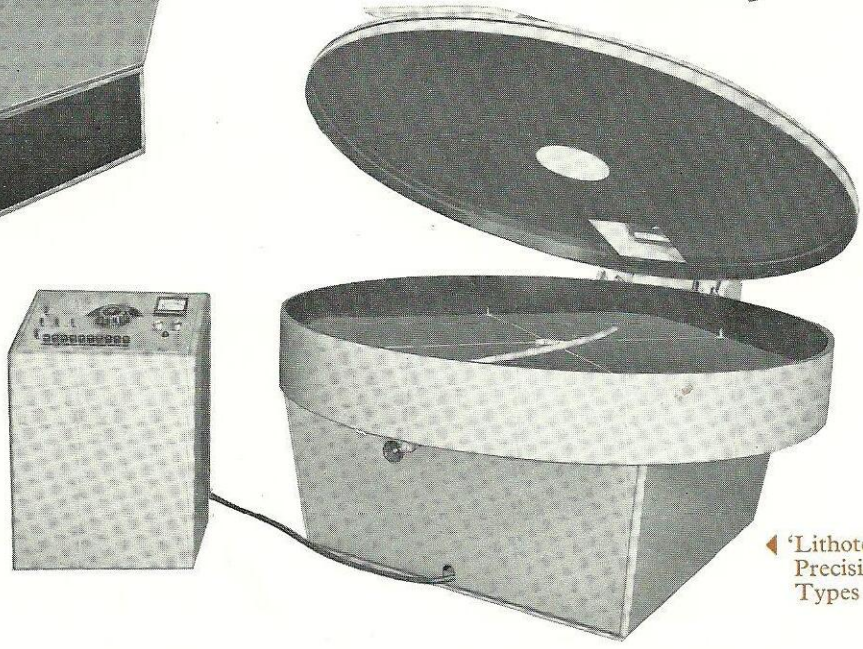


'Lithotex'
Whirler Type 116

▲ 'Lithotex' 4-Frame
Exposure Cabinet Type 74



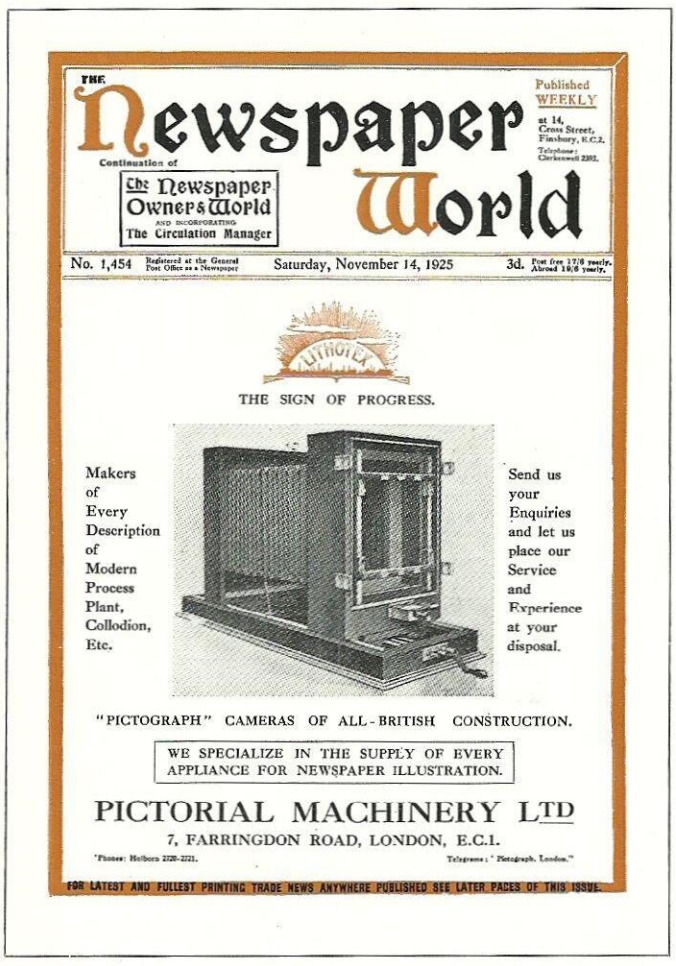
▲ 'Lithotex' Twin-frame
Printing-down Unit
Type 77



'Lithotex'
Precision Whirler
Types 119, 120, 121

Process Cameras

Only three years after the start of the company, Pictorial Machinery launched a new department specialising in process cameras. It was followed in 1923 by an intensive advertising campaign on behalf of 'Pictograph' Process Cameras and the ensuing quotation from the publicity leaflet authoritatively conveys the level of camera design and construction at that time. 'Pictograph Process Cameras and Stands . . . are particularly well and solidly built . . . The screen gear [i.e. for a halftone screen] is of extremely solid construction, maintains the screen at absolute parallel no matter at what distance from the plate [i.e. photographic plate], while the darkslide is held firmly and truly in perfect register with the focusing glass . . . The cameras are made in two styles, one costing less than the other, the No. 2 Cameras having not so fine a finish and with a cheaper wood stand. The stands supplied in both styles are good solid pieces of construction, all vibration being taken up by substantial and effective spring arrangements, with turntable [i.e. for lateral reversal] and extra large copyboards. More elaborate stands of either metal or wood (with turned and decorative legs, etc.) can be supplied, but these strong and simple wood stands are all that is necessary or desirable for the production of accurate work.'



A small camera for producing negatives up to 8 × 10 inches was amongst the equipment in a 'Lithotex' Poster System of 1923. Apparently the equipment package was intended for preparing 'large photolithographic posters' and included enlarging apparatus for blowing up the 8 × 10 negative to 20 inches lineal as well as a special system for projecting the intermediary 20-inch negative direct on to a sensitised metal plate of 45 × 65 inches. Other equipment in the system consisted of a retouching desk, a drying cupboard for negatives, and a whirler.

'Lithotex' Process Cameras

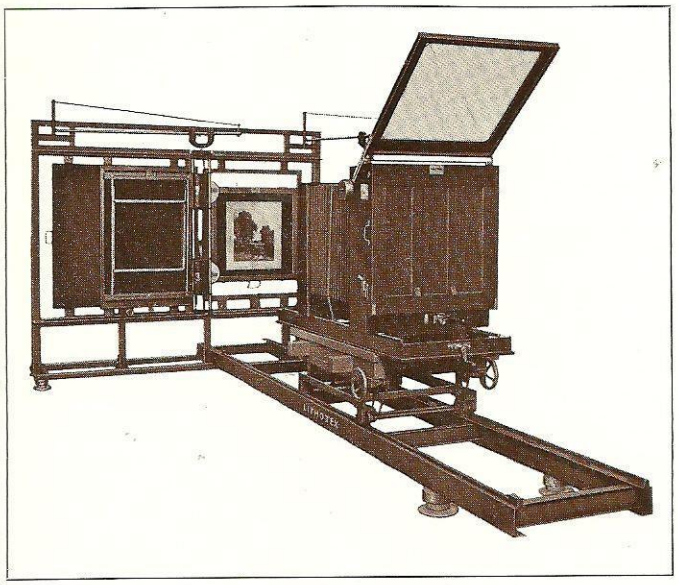
In truth, the differences between the cameras of Pictorial Machinery and those of their competitors in the early days were very slight, while any differences and developments that did occur tended to be confined to the track and to the copyboard end of the equipment. That there was little to choose between outwardly competitive products is scarcely surprising when one realises that most of the cameras of the inter-war period came from a single source, namely Camera & Process Manufacturers Ltd. Doubtless the situation gave rise to plenty of jockeying between the vendors to secure favours from the manufacturer, as evidenced by a decision of Pictorial Machinery's board in 1925 'to advance more money to gain better deliveries'. The differences that were to be seen between the various process cameras came mainly from the design departments of the supplying companies, rather than from the manufacturer. And though the differences themselves amount to little more than minutiae when seen within the overall context of the cameras, they are nonetheless historically interesting.

For example, Pictorial Machinery utilised lead screws for registering the rear body of their cameras, whereas competitors employed a rack-and-pinion mechanism for the same purpose. Another difference concerned the focusing screen which, on 'Lithotex' models, swung upwards and was counterbalanced above the camera when not in use, while a sideways movement was preferred on other cameras. Similarly, a 'Lithotex' camera of the inter-war period was equipped with a channelled or girder-like track as opposed to the tubular form of alternative

products. Despite these and other differences, the mahogany camera bodies and ancillary equipment were almost identical and the printer had little real choice.

In 1925, Pictorial Machinery issued a leaflet for a 'Lithotex' Exhibition Model Process Camera, a name coined for the trade show of that year. It had a channelled metal track mounted at about waist height on anti-vibration springs. Likewise, the turntable for moving the camera body parallel to the copyboard (in laterally-reversed work) was of metal construction. Mahogany, or in special cases teak, was employed for the camera body, while a wooden copyboard and removable transparency holder completed the unit, the copyboard being fixed rigidly and squarely to the track as was also the mounting for four open arc lamps. Lead screws can be clearly discerned as the method of adjusting the rear body and metal was employed for the halftone screen gear, with a neat adjustment for distance fitted near the focusing controls.

No substantial changes were made to 'Lithotex' cameras until after the company's removal to Hatton Garden in 1933 when some camera manufacturing began internally. Soon afterwards, a leaflet for a 'Lithotex' Camera Outfit was issued and illustrations of the equipment show some interesting developments. Most noticeable was that the channelled track, still supported on anti-vibration springing, had been lowered to just above floor level; while the camera body and turntable were mounted on a



trolley that ran along the trackway with greater ease than the previous arrangement of the camera body sliding directly upon the stand. Furthermore, the trolley was necessary to raise the camera to a convenient working height. The other immediately recognisable change is in the design of a copyboard far removed from the previous rudimentary wooden panel to which the original was pinned. It consisted essentially of a metal framework forming a slideway for a transparency holder and for a reflection copyholder. Either of these could be substituted for the other, as required, by moving them along the guide rails to the left for laterally-reversed work and to the end of the track way for direct exposures; neither had to be removed completely.

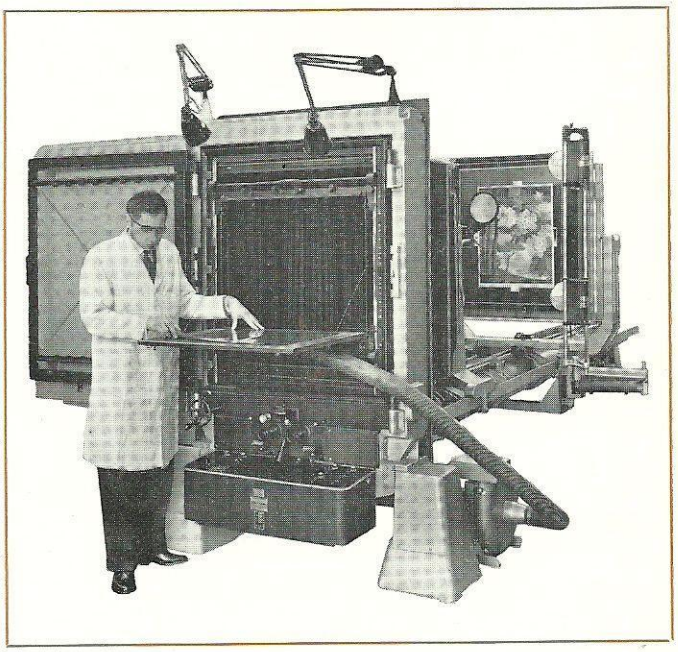
Masking blinds formed part of the transparency holder along with a retractable white reflecting sheet for dropping behind the original. For reflection copy, a pressure-type holder was provided consisting of a baseboard with a hinged glass cover. It was loaded in the horizontal position and swung to the vertical for exposure. If the more advanced design was not wanted, a printer could have a straightforward copyboard that slid within the standard framework. Apparently the cameras were supplied in a range of sizes from 10 × 12 to 40 × 60 inches.

Virtually no other changes of any great substance or principle occurred in 'Lithotex' Process Cameras from the middle of the 1930s until their discontinuance in 1957, though well over 500 were sold.

Regal Darkroom Camera

Gallery cameras of mixed metal and wood construction dominated the market until after the Second World War when their supremacy was challenged by a series of new designs, among them the Regal Darkroom Camera. E. O. Corkett, F. T. Corkett's younger son, had made a fairly extensive survey of market trends in the United States during 1945 and returned to England utterly convinced that a demand would arise for a large precision darkroom camera such as he had seen on the other side of the Atlantic. At that time no European manufacturer had produced an all-metal darkroom camera, though the working principle was not entirely alien: a few of the wooden process cameras had been adapted to darkroom operation by modifying the rear body. E. O. Corkett was not interested in compromises and briefed the design and development staff of Pictorial Machinery to build a metal darkroom camera of completely new concept.

At the British Industries Fair of 1948, the results of the project emerged as the Regal Darkroom Camera. It had a maximum negative size of 30 × 30 inches with a range of double enlargement down to quarter reduction and was of all-metal



construction and darkroom operated. Lens column and copyholder traverses were motorised and effected along a trackway consisting of a substantial steel tube that also served as a conduit for electric cables and some operating mechanism. Without the operator moving outside the darkroom, nearly everything could be operated from a panel built into the rear body. Grouped on this panel were controls for the motorised traverses of the copyholder and lens column; for the rise-and-fall and lateral movements of the lens; for the motorised rotation of the transparency holder; for the motorised flash exposure; and for the remote actuation of arc lamps and shutter.

Incorporated in the rear body was a vacuum filmholder, a focusing screen, and permanent accommodation for three halftone screens. The latter device enabled any one of the screens to be selected and moved rapidly into the working position without being touched by hand, an aid that eliminated the danger of breakage and reduced spoilt work by obviating finger marks.

An apochromatic lens was fitted in the lens column, together with a 'Lithotex' Diaphragm Control and an electrically-operated shutter (a far cry from manually removing a lens cap). Additionally, a turret containing five optical-flat filters was included, along with a screen compensator and a flash exposure unit. And for laterally-reversed work, an optical straight-line reversal system was designed, because the camera body could no longer be turned parallel to the copyholder and fitted with a prism as with the older gallery cameras, owing to the rear body forming part of the darkroom wall. Completing the equipment were a transparency holder, a vacuum copyholder for reflection originals, and a set of arc lamps.

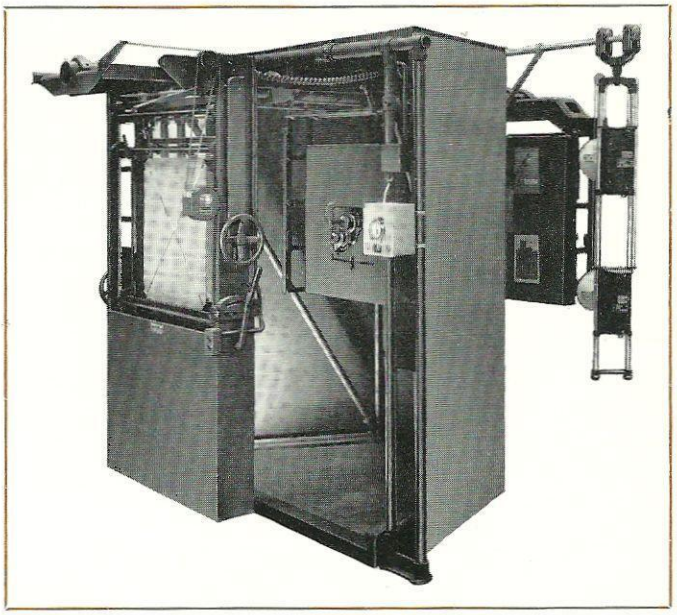
Clearly the Regal Darkroom Camera represented an enormous stride forward from the earlier gallery cameras and too much may have been attempted at once. It took two years for the first order to materialise, and only 19 cameras were built and sold in the ten years of its existence. The design was clearly a long way ahead of its time as the first *modern* European-built darkroom camera, and its lack of success was probably due to the fact that its automation concept was difficult to grasp by people entrenched in the use of wooden gallery cameras. The project reminded Pictorial Machinery of the lesson learned some years before, that innovation and profitability do not necessarily go hand in hand.

Photomaster and Supramatic Darkroom Cameras

Despite disappointments with the Regal camera, Pictorial Machinery had again broken new ground in 1954 with a Photomaster Darkroom Camera. It represented an attempt to build a simple camera with easily-operated and inexpensive darkroom controls, occupying a minimum of floor space, and having the capacity to tackle colour reproductions. In many respects the design specification was met, but the transformation of the idea into actual production left something to be desired.

Basically the body of the camera consisted of a cabinet structure housing a bellows-and-lens assembly which faced a fixed copyholder, the whole unit being supported centrally from an overhead tube. By adopting the principle of overhead suspension for the entire camera and illuminants, the operator could gain access to the copyholder unimpeded by the usual paraphernalia of a process studio.

Negatives up to 24 × 24 inches represented the limit of a Photomaster camera, while the range covered by two lenses extended from × 5 reductions to × 2¼ enlargements. It was the use of two lenses, coupled with the unique design of the camera, that restricted the overall length to under 13 feet, including the back swing of the arc lamps for transparency work. Furthermore, the width of the camera was less than 8 feet, so that the design aim of economical working space was easily achieved when compared with floor-supported cameras of similar capacity. Forming part of the rear body was a counterbalanced plateholder and focusing screen that slotted in and out of a storage magazine.



All the other accoutrements of modern camera technology were embodied in the basic design, except for a straight-line image reversal system, yet the project achieved only eight sales in seven years. Good ideas, indifferently applied, had led to another commercial failure. Worse was to follow in 1960 when the Supramatic Darkroom Camera came on to the market only to be withdrawn in 1963. Again the camera incorporated many brilliant ideas which unfortunately seemed to defy satisfactory realisation by production engineers.

Although the Regal, Photomaster, and Supramatic set-backs must have been frustrating, the technical lessons learned the hard way were not to be wasted. They were to formulate a most ambitious design and manufacturing programme, started in 1961 and still going on, that was to establish Pictorial Machinery as one of the leading suppliers of process cameras. It will be noted that the programme began before the final collapse of the Supramatic project and first took shape in 1963 as a 'Lithotex' Precision Darkroom Camera (Type 38) to be followed by no less than six complementary models by 1968. Currently, camera production accounts for 50% of Pictorial Machinery's manufacturing capacity, an eloquent testimony to the success of the overall programme that had to restore lost prestige and obliterate memories of three ill-fated ventures.

'Chemco' Roll Film Camera

Though Pictorial Machinery had always held a reasonable share of the photoengraving market, the early successes of the business tended to be with photolithographers and photogravure printers. In some respects, the bias of trading had been fashioned by the views of F. T. Corkett and his relative lack of interest in process engraving during the first decade of the company's existence. Even so, one must not overlook the fact that the exposure cabinet, bench vacuum frames and whirlers were all designed principally for process engravers and were given form under his leadership. Nonetheless, the marketing emphasis remained with photolithography. After the Second World War, his sons, E. O. Corkett and J. F. L. Corkett, resolved to make greater inroads into photoengraving and scored two successes with a 'Chemco' Roll Film Camera and powderless etching machines, both of which helped to establish Pictorial Machinery as a leading equipment supplier in the field.

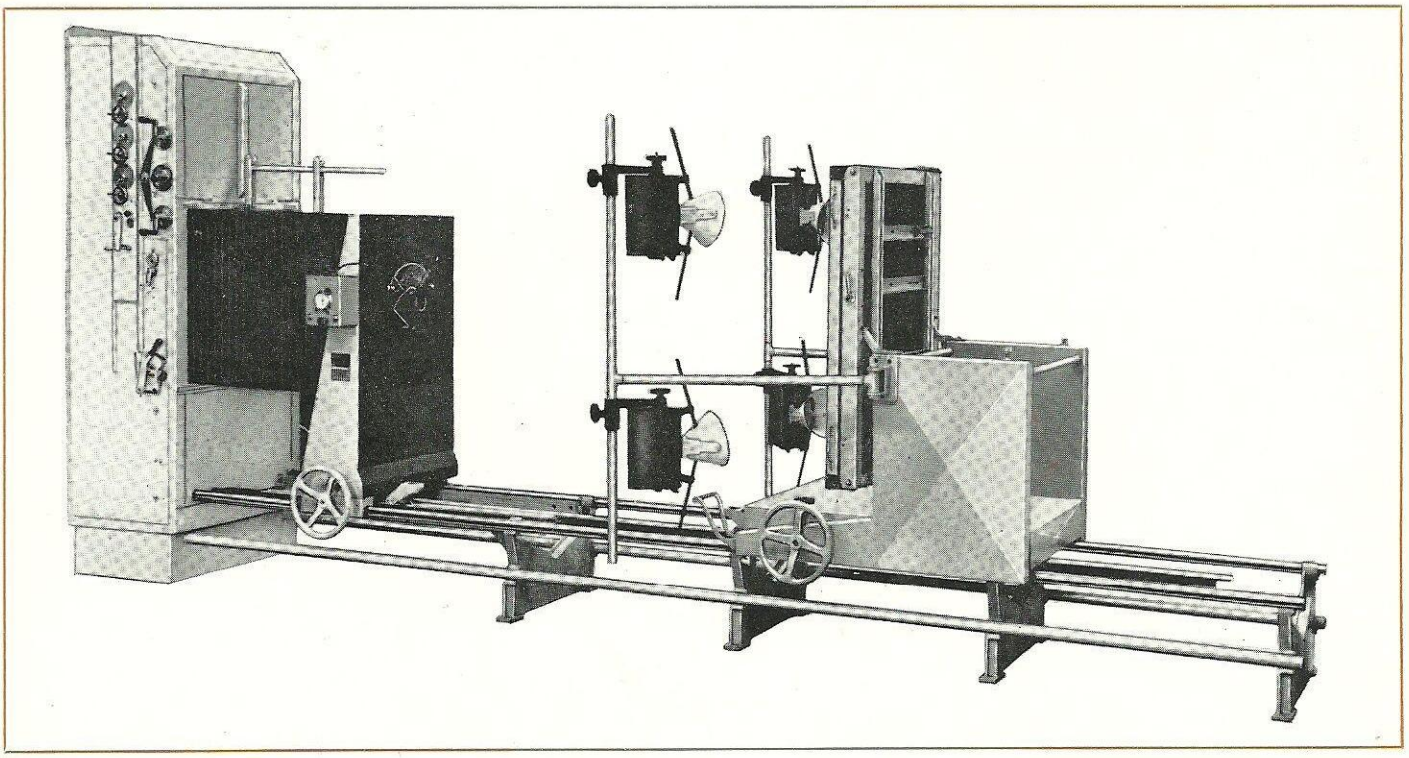
In 1949, E. O. Corkett crossed the Atlantic again to study market trends in the United States and amidst keen competition from other European companies secured the world manufacturing and selling rights for the 'Chemco' Roll Film Camera. Four of them were sold in 1951, and during the next four years 'Chemco' cameras were supplied at the rate of more than one a month. In ordinary circumstances, the record could be considered remarkable, but the 'Chemco' camera was quite extraordinary in concept and offered hitherto unknown production aids to process work. Therefore, the initial response of the printing industry could be justifiably described as lukewarm, though it was to become more enthusiastic.

Apparently two aspects of the camera tended to act as barriers to immediate acceptance. The first was the abandonment of visual focusing in favour of a system of setting the lens column and the copyboard to calibrations on focusing scales according to a table of reductions, which has now become standard practice. The second obstacle arose from the use of film, since the majority of photoengravers in 1950 still employed wet plates for black-and-white work. In fairness, the use of roll film as opposed to sheet film for process work in 1950 posed something of a problem, since no photographic manufacturer supplied suitable materials. However, Gevaert Ltd were one of the first to fill the gap in Europe during the early days, and other suppliers eventually entered the field. Nevertheless, the slow availability of appropriate roll films in sufficient variety must have deterred some prospective purchasers.

Like the Regal, the 'Chemco' camera was of the darkroom kind. It was of all-metal welded construction with a tubular-style track. All the controls were concentrated on a panel in the daylight just outside the darkroom door. It had a maximum negative size of 20 × 24 inches with a range of reductions down to one-eighth and of enlargements up to $2\frac{1}{2}$ times the original size. Three widths of roll films (20, 15, and 10 inches) could be loaded as spools into the rear body magazine.

Stripping film was favoured to provide a means of laterally-reversing the image in lieu of an optical straight-line system, but current clear-back films offer a more rational alternative. Roll film enabled successive exposures to be made without the tedious interruptions of loading and unloading inevitable with sheet materials. The appropriate lengths of film were wound down from the selected spool to the vacuum filmholder for exposure and afterwards cut off for storage in a compartment beneath the magazine. As a result several pieces of film could be processed simultaneously.

The focusing of an image was carried out by means of scales fixed along the track, while the lens shutter was either electri-



cally or manually operated. Exposures were governed by a synchronous timer or by a photo-electric meter. Likewise, the lens diaphragm was set on a scale that corresponded to matching camera extensions, the device being known as a 'Chemco' Stop Rationer. The copyholder, illuminated by four open arc lamps, was of the pressure type.

By present-day standards, the original 'Chemco' camera was ugly, but highly efficient. Along with the Regal camera, the roll-film approach signalled the transformation of process work from a craft to a science, and in partnership with powderless etching it created new criteria of productivity in photoengraving where the bulk of work was black-and-white. It is claimed that the output of one roll-film camera can equal that of three sheet-film units!

With the patentees' approval, Pictorial Machinery introduced an improved version of the 'Chemco' camera in 1956 to be followed in 1964 by American initiative with a 'Chemco' Marathon Roll Film Camera which was soon adopted and built in Crawley. In essence, the Marathon model simply advanced the working principles of the earlier camera and applied them in a more rational and productive manner. The choice of film widths was extended to five (6, 10, 16, 20, and 24 inches), though only three spools could be accommodated in the magazine at one time. Furthermore, the maximum negative size was increased to 24 × 24 inches and the camera range changed to × 3 enlargements and × 7 reductions.

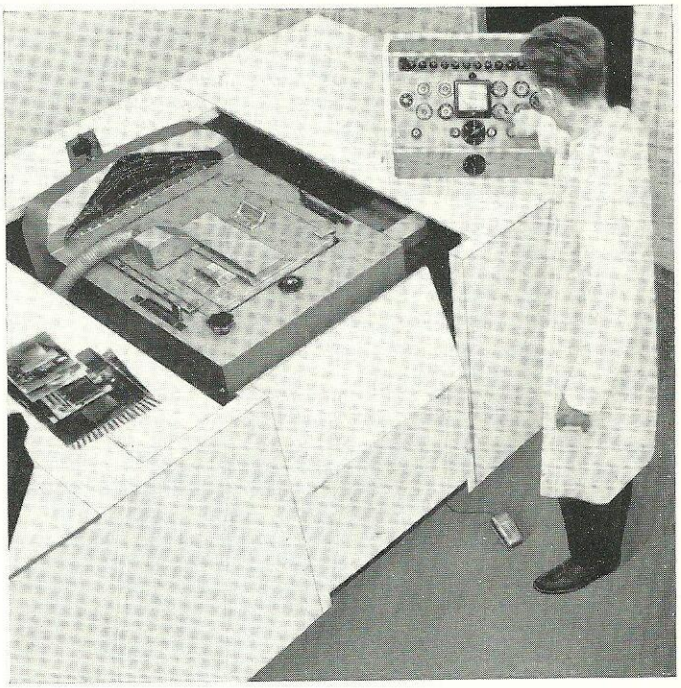
In 1966 the agreement between Pictorial Machinery and Chemco Photoproducts Inc. was terminated by mutual consent, though the initiative was taken by the Americans, who were worried by the failure of the United Kingdom to gain entry to the European Economic Community and the attendant trading difficulties that were likely to ensue. Nevertheless, the period of association was fruitful and resulted in the sale of about 125 cameras. By 1967 Pictorial Machinery was ready to market its own roll-film cameras.

'Rotadon' Darkroom Camera

Before going on to review current 'Lithotex' cameras, mention must be made of the 'Rotadon' Darkroom Camera. It was the brain-child of R. Guppy and was shown initially at IPEX 1955 by D. O. Nicoll Ltd. It later underwent refinement and from 1961 was manufactured under licence by Pictorial Machinery who also held the world selling rights outside the United Kingdom.

The 'Rotadon' camera was a compact unit – consisting of copyholder, lamps, lens, bellows, and filmholder – suspended on trunnions so that it could be rotated through 180°, the whole assembly occupying very little floor area. Working procedure was confined to the darkroom and could be performed from a static position, thereby eliminating wasteful movements. Focusing was effected by means of scales calibrated on a percentage basis, while the camera could be turned over on its axis by push-button control to present either the copyholder or the filmholder uppermost for loading. Twenty seconds was quoted as the time necessary for positioning the original and focusing to size, if the operator rushed!

Nearly 50 'Rotadon' cameras were sold between 1962 and 1968 when the licensing agreement between R. Guppy and Pictorial Machinery was concluded. As alternative and more conventional products progressed technically and became available at relatively modest prices, so the competitiveness of a 'Rotadon' camera waned. The original conception was masterly and imaginative but it outlived commercial appeal because of changes in the trade and not because of shortcomings in the design.



'Lithotex' Precision Darkroom Cameras (Types 37, 38 and 39)

At IPEX 1963, a 'Lithotex' Precision Darkroom Camera (Type 38) was shown to the printing industry for the first time. It was to mark the beginning of a new dynasty of 'Lithotex' cameras that in 1968 ran to seven complementary models. During this jubilee year of 1969, the range has been increased to eight with the introduction of a new model at the GEC exhibition in Milan.

The thinking behind the design of the Type 38 camera was based on the desire to produce a precision *machine tool* for the graphic arts industry: and this is instantly identifiable in a heavy cast track of immense rigidity painstakingly machined with flat and V-shaped datum surfaces for maintaining the squareness of the lens column and copyholder. Clearly the solidity of the track holds the key to the preciseness of the Type 38 equipment, a sharp contrast to the lighter spring-mounted stands, still employed for some cameras, that tend to yield under weight transferences as the lens column and copyholder pass along.

Simplicity has been the keynote of the design. Movements of the copyholder and lens column carriages are effected manually to eliminate the cumulative errors of lead screws normally associated with motorised schemes. Similarly needless sophistication in the form of moving parts for varying the image position laterally and vertically or for automatic focusing has been avoided. Clearly every extra movement on a camera increases the risk of error because of the tolerances required between

moving parts. On the other hand, the elimination of unnecessary moving parts has not been accomplished at the expense of over-burdening the operator. For example, centralisation of the image can be most easily achieved by positioning the original to guidelines in a suitably marked copyholder. Equally, focusing can be quickly attained by adjusting the copyholder and lens column carriages with handwheels to optical scales along the track, and fine settings to 0.01 mm are possible.

Glass negatives up to 32 × 32 inches and film equivalents up to 24 × 32 inches represent the capacity of the Type 38 camera, while two apochromatic lenses with focal lengths of 21 and 30 inches give a range of × 2 enlargements and × 5 reductions. A greater range to × 5 enlargements can be provided with a third lens of 15-inch focal length. Additionally two mirror systems are incorporated on a turret, a roof configuration and a plane surface respectively, for the consecutive production of laterally-reversed and direct images. At the copy end of the camera, a glass-fronted vacuum holder is supplied for reflective originals up to 40 × 40 inches and, as an optional extra, a transparency holder can be obtained for subjects up to 32 × 32 inches. Copy illumination is available in three alternative types: (1) six 1,350-watt tungsten-halogen lamps, (2) four 1,500-watt pulsed-xenon lamps, and (3) four 30-amp arc lamps. For transparency work, a cold-cathode light source on a mobile stand has been designed.

The Type 38 concept proved to be so successful that in 1966 a 'Lithotex' Darkroom Camera (Type 39) came on to the market as a supplement. In every respect the Type 39 is identical with its predecessor, except that the straight-line image reversal system has been omitted from the optics leaving just two lenses mounted on a turret. Consequently, photolithographers and others not requiring left-to-right reversals are spared the expense. Over a dozen countries have received Types 38 and 39 cameras in quantity and wherever they are used their accuracy is regarded as unmatched.

Elsewhere in the *Recorder* reference has been made to the new standards of accuracy imposed by emerging markets, particularly by the makers of printed circuits, a trend that has put photomechanical engineers very much on their mettle. Unerring and consistent performances under industrial conditions by the Types 38 and 39 cameras soon convinced Pictorial Machinery that the machine-tool approach embodied in these designs was most apt for the electronics market, but that certain extensions would be necessary to satisfy every justifiable demand. Consequently, a 'Lithotex' Precision Reduction Camera (Type 37) was brought out in 1968.

The peculiar demands made on a camera by printed-circuit production are interesting. Overriding everything else is the need for unfailing accuracy in sizing and focusing, completely independent of operational skills. Furthermore, the camera must be capable of repeating the size and squareness obtained in a negative whenever necessary. Such is the innate intricacy and scale of printed circuits that reductions down to one-tenth of the original size are not uncommon, the relatively big and complex line drawings usually being made on a translucent, stable material and therefore requiring projection copying.

To measure up to these peculiarities, the Type 37 camera differs in several respects from the Type 39 model. First, the camera track has been lengthened to cope with × 10 reductions and is used in conjunction with lenses that amply cover the large originals. Secondly, the precise handling of transparent originals has given rise to the development of a special vacuum copyholder containing a clear plastic blanket with rubber surrounds that permits illumination from behind. Thirdly, to illuminate the transparent originals, a cold-cathode light source is supplied which, as it does not generate heat, maintains stable conditions for the drawings. Fourthly, a holder for glass photographic plates is included as standard equipment in the rear body of the camera, since the exactness of the work necessitates the employment of stable materials at all stages of production. And lastly, the guaranteed tolerances of the Type 37 camera were much more stringent than that for the Types 38 and 39. Its authenticity has been demonstrated time and time again in printed-circuit establishments, so much so that one leading British company in the electronics field has installed no less than five Type 37 cameras.

'Lithotex' Darkroom Cameras (Types 40 and 41)

In 1966, Pictorial Machinery set out to capture a large slice of the middle-range camera market with a 'Lithotex' Darkroom Camera (Type 40). They had the larger-scale work amply within the scope of the Types 38 and 39 and the smaller-scale area of the market came within the purview of a 'Lithotex' Major Repro Unit (see small-offset packages, p. 30), so that the introduction of a Type 40 camera completed the market coverage. In most respects, the success of the Type 40 camera has been phenomenal with the number of installations now approaching 250 spread over more than 50 countries.

Maximum negative size on a Type 40 camera is 20 × 24 inches. At the back of the equipment, the image plane is of novel conception, though owing something to that on the earlier and ill-fated Photomaster. The vacuum filmholder and the focusing screen are on a counterbalanced system guided by linear ball-bushings. When the one is lowered into a recessed compartment the other comes into working position in the same plane. From a single wide-angle lens, the camera spans from × 2½ enlargements down to × 4 reductions, while alternative lenses are available to extend the range. A Type 40 camera is suitable for producing direct negatives only unless the user exposes through the back of thin-base or lateral-reversal films. However, a Type 41 camera was introduced in 1967 which incorporates a straight-line image reversal system as well as a direct system. In every other way, the Types 40 and 41 cameras are identical. Scale focusing is used on both models enabling positions to be set within 0.1 mm, the settings being obtained by reference to a book of electronically-computed co-ordinates. Carriage movements are motorised and operable at fast and slow speeds from inside and outside the darkroom. Originals up to 30 × 40 inches can be accommodated by the glass-fronted pressure copyholder which opens book-fashion for loading. Four 1,250-watt tungsten-halogen lamps provide the copy illumination.

Reliability has been a keynote in the production engineering of the Type 40 range, as is evident in the linear ball-bushings on

the carriages that run on hardened trackways by means of rack-and-pinion gears. Thus, the copy, lens, and image planes are maintained perfectly square and parallel, while linear ball-bushings are virtually friction-free and, therefore, not subject to the same degree of wear as ball-bearings. Another very important feature of the Type 40 camera is that the floor space occupied does not exceed that for a vertical camera of comparable negative capacity, a major innovation in camera design. Furthermore, Type 40 cameras do not impose the restrictions of a vertical camera, such as limited maximum copy size, an inflexible optical system, and so on.

'Lithotex' Roll Film Cameras (Types 44 and 45)

When the agreement between Pictorial Machinery and Chemco Photoproducts Inc. came to an end in 1966, a 'Lithotex' Roll Film Camera was developed and first shown at the DRUPA exhibition of 1967. Apart from the rear body that houses the roll-film mechanism, the camera is identical with the Types 40 and 41. Consequently, the features of the camera track, lens column, copyholder, scaling, etc., are the same. Two models of the roll-film camera are marketed: a Type 45 for consecutive direct and reverse working and a Type 44 for direct working only. Three 200-foot rolls of film, selected from widths of 6, 10, 12, 16, 18, 20 and 24 inches, can be held in the film magazine. More than 30 installations of 'Lithotex' Roll Film Cameras have so far been completed.

'Lithotex' Vertical Camera (Type 24)

To round off Pictorial Machinery's range of cameras, an Algraphy-'Lithotex' Vertical Camera (Type 24) was released in 1966. It has a maximum negative size of 14 × 18 inches; a range of × 4 enlargements and × 4 reductions; a maximum size of 20 × 24 inches for flat copy, and two 800-watt quartz iodine lamps for copy illumination. Well over 250 of these cameras are now in the field.

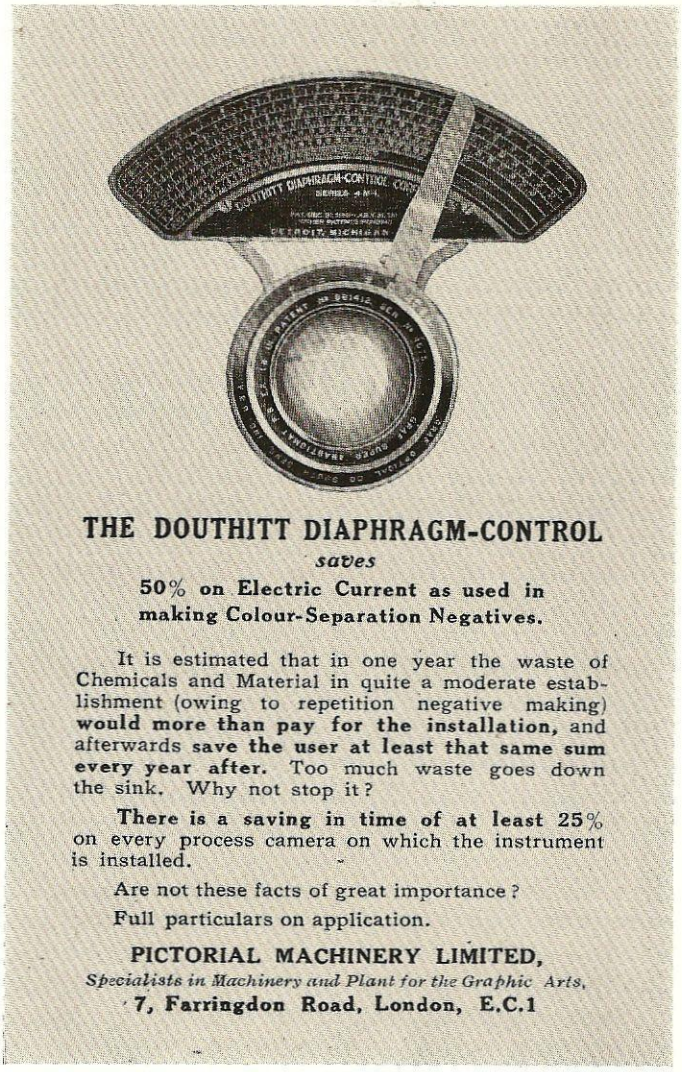
'Lithotex' Darkroom Camera (Type 42)

At the GEC exhibition in Milan during Pictorial Machinery's jubilee year of 1969, yet another 'Lithotex' Darkroom Camera (Type 42) has been launched for printers specialising in smaller work formats up to 16 × 20 inches. Doubtless the camera will contribute to the enviable reputation of Pictorial Machinery as producers of precise, reliable, productive, reasonably-priced, and sensibly-designed cameras that do not saddle users with wasteful and needless elaboration.

Camera controls

Standardisation of workshop practice as a means of quality control has been a traditional interest of Pictorial Machinery from the earliest days. In 1922, the company took on the European agency of the American Douthitt Diaphragm Control, which was one of the first commercial and successful attempts to systematise camera operation. It consisted essentially of an indicator attached to the front body of the camera that was moved over a scale by a cord or flexible wire synchronously with adjustments of the bellows extension. Once the camera extension had been established, the position of the indicator on the scale showed the matching lens aperture to be employed. In addition to determining the stop size, the Douthitt system tried to regularise halftone negative production with tables of basic exposures to be given with different screen rulings, as well as providing production data on the flash stop, screen distance, and other variables.

In 1923, the cost of a Douthitt Diaphragm Control was quoted at between £65 and £70, but return on the investment assured commercial success. A printed postcard sent out by Pictorial Machinery endeavoured to show potential savings in these terms: 'The Douthitt Diaphragm saves 50% on electric current as used in making colour-separation negatives . . . It is estimated that in one year the waste of chemicals . . . in quite a moderate establishment [owing to the repetition negative making of spoilt work] would more than pay for the installation and afterwards save the user at least that same sum every year . . . There is a saving in time of at least 25% on every process camera on which the instrument is installed.' These arguments were soon accepted by the printing industry, and the Douthitt control provided a brisk trade for Pictorial Machinery until 1934 when it was superseded by the Muller system.



Emil Muller, the inventor of the Muller System of Diaphragm and Screen-Distance Control, was employed by Pictorial Machinery in 1926 as an instructor/demonstrator in photolithographic practice, but towards the end of that decade he decided to return to the Continent. However, the association was resumed in 1934 when Pictorial Machinery took on the marketing of the Muller control system which consisted of two main parts: a diaphragm meter and a lens scale. The meter, fitted to the front body of the camera, was connected by a metal tape to the rear body for measuring the camera extension and for giving three instant readings to be set as required on the lens scale.

The Muller system was designed to cope with six-colour photolithographic work, so that the lens scale consisted of five concentric sets of calibrations to cover diverse negative requirements. The central scale of the five represented the norm for monochrome and trichromatic work, while the associated scales related to darker and denser colours in one direction and to lighter and thinner colours in the other direction. All scale calibrations corresponded to readings on the diaphragm meter, while the confusion of a multiplicity of scales was overcome by a unique masking system to obliterate the irrelevant information.

The Muller system was unquestionably more sophisticated than the earlier Douthitt control, primarily because of its relevance to multi-colour reproduction, but the system still had to be calibrated to suit individual lenses. However, in 1950, Pictorial Machinery overcame this last problem with a 'Lithotex' Diaphragm Control, the only system that could be used with any focal length of lens without the necessity of separate calibration. In essence, the 'Lithotex' device was a simplified and refined version of the Muller system and the two had much in common.

Illuminants

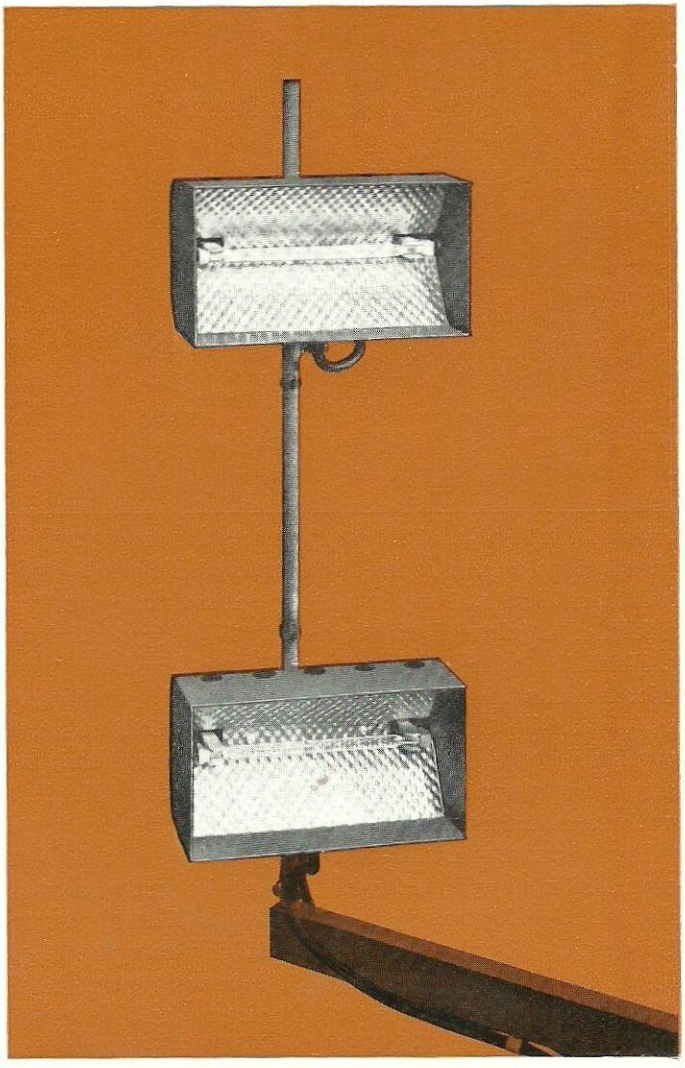
Up to 1939, Pictorial Machinery imported open arc lamps from Germany. With the outbreak of war, the company had to make its own and for expediency took the original Staub & Zimmer design as a master. Consequently, in 1941, a 'Lithotex' High-Power Printing-Down Lamp (Model V) was introduced. Nearly 1,600 of these 50-amp lamps have been sold for printing-down, while an improved version still enjoys great demand. Nowadays the lamp mounted on a pedestal is known as a Type 129 and the same lamp suspended for downwards burning as a Type 130. Little change has occurred in the basic design over the years, if for no other reason than that change has not been found necessary.

Contemporaneous with the Model V lamps came the 'Lithotex' Copyboard Arc Lamps (Model R) for illuminating camera copy. They were usually mounted in pairs, either on a pedestal or on counterbalanced hanging supports. The Model R lamps ran at an economical 15 amps for focusing, and by flicking a switch-over control were boosted to 30 amps for exposing. In the face of competition from alternative copy illuminants, such as pulsed-xenon and tungsten-halogen, the arc lamp has tended to be discarded for camera work and the Model R lamps are no longer available.

Never content just to tag along, Pictorial Machinery have been responsible for innovations in the illuminants field. For 'Printex' step-and-repeat machines, a Type L self-feeding arc lamp was devised which proved to be efficient and popular until ousted by more modern light sources. And in 1965, a 'Lithotex' Arc Lamp (Type 133) was designed with a rating of 150 amps for cutting down exposure times when printing-down to plates.

It will be appreciated that to secure adequate and even coverage of a big machine plate, the distance between vacuum frame and light source must be increased and becomes subject to the inverse square law for exposure. Consequently, if the distance between frame and light source is doubled, the exposure time must be quadrupled: a matter of some concern with the Types 129 and 130 lamps having 50-amp ratings, because the exposure times could become uneconomically protracted. Admittedly the need for long exposures would not worry departments committed to the production of only a few plates each day, but in busy departments, with a heavy work loading, the curtailment of exposures becomes vital. It is in the latter kind of situation that the Type 133 lamp excels and offers plenty of advantages, not least among them being that exposures are one-third the duration of those necessary with the Type 129 equipment.

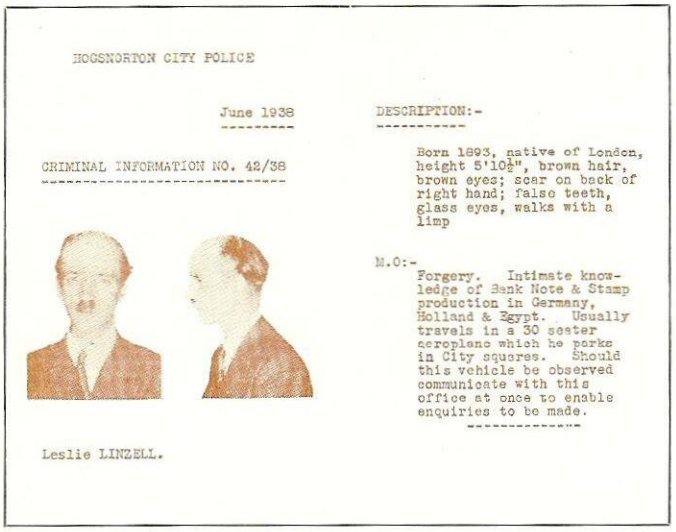
What is particularly interesting in this jubilee year is the news that Pictorial Machinery have developed, and will be the first British company to manufacture, tungsten-halogen illuminants



for their own process cameras. Tungsten-halogen lamps are known to have good spectral distribution and are clean and economical to run, but a drawback has been their lack of intensity that tends to prolong exposure times. However, the 'Lithotex' Tungsten-Halogen Lamp Heads (Type 152) have been designed to overcome the disadvantage. They consist of 1,250-watt lamps run directly from the mains, whereas previous units have been rated at 500 watts and over-run through a converter. The new lamps will consume more power, but practical tests have shown that exposure times can be halved. Furthermore, the working life of the 'Lithotex' lamps is expected to be double that of previous designs, yet the replacement costs have been pruned by nearly 50%.

Small-offset packages

It was in 1938 that Pictorial Machinery first introduced an equipment package designed for small-offset printers, though separate items in their range must have been used previously in this sector of the industry. Seemingly the package, known as 'Lithotex' Photographic and Platemaking Equipment for Multilith and Rotaprint Machines, was originally compounded to enable police forces to circulate speedily the details of wanted



HOGSNORTON CITY POLICE

June 1938

CRIMINAL INFORMATION NO. 42/38

DESCRIPTION:-

Born 1893, native of London, height 5'10½", brown hair, brown eyes; scar on back of right hand; false teeth, glass eyes, walks with a limp

M.O:-

Forgery. Intimate knowledge of Bank Note & Stamp production in Germany, Holland & Egypt. Usually travels in a 30 seater aeroplane which he parks in City squares. Should this vehicle be observed communicate with this office at once to enable enquiries to be made.

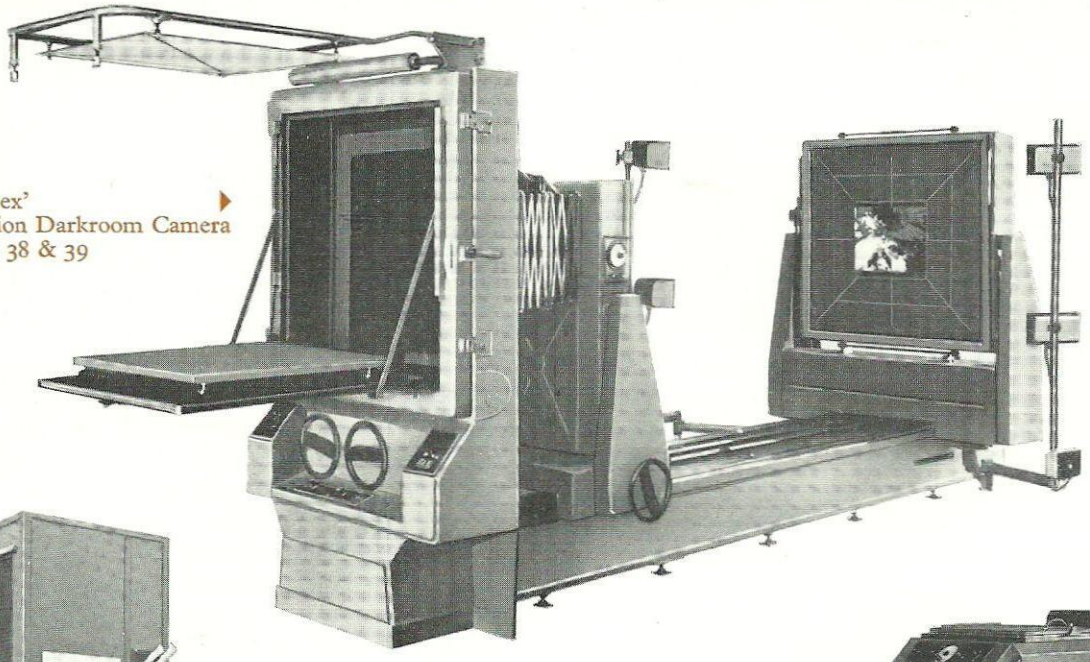
Leslie LINZELL.

criminals. It included a 'Lithotex' Process Camera for making negatives up to 12 × 12 inches (complete with stand, copyholder, arc lamps, Douthitt control, and halftone screen); a 'Lithotex' Minimus Plate Coating and Drying Machine; a 'Lithotex' Vacuum Printing-Down Frame for plates up to 16 × 20 inches (complete with enclosed arc lamp); and a 'Lithotex' Retouching Desk to take work up to 10 × 12 inches. There was nothing special about most of these items, though the concept of supplying a complete processing package for small-offset work was rather novel.

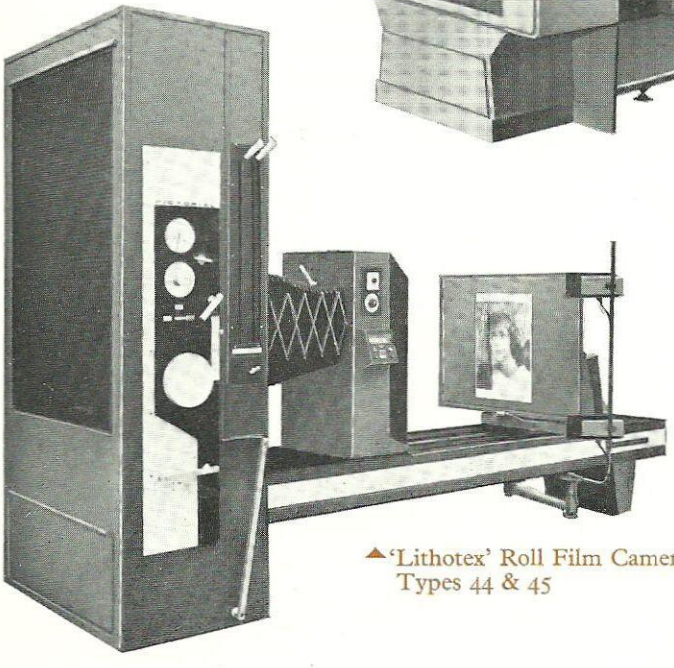
It was in 1956 that Pictorial Machinery returned to the idea of an equipment package for small-offset printers: the renewed interest being kindled by P. E. Goodall of The Monotype Corporation. He persistently exhorted the management of Pictorial Machinery to acknowledge the enormous potential of the small-offset market and went so far as to build a prototype of what was to become a 'Lithotex' Repro Unit in his own garage.

Unlike the earlier package of 1938 that had consisted of collected items of standard 'Lithotex' equipment, a 'Lithotex' Repro Unit was an original conception designed for simplicity and compactness, yet with some of the refinements found in bigger equipment. It was an all-purpose unit, competitively priced, but without technical skimpiness. When delivered, a 'Lithotex' Repro Unit came in a specially-constructed packing case, which after installation acted as a bench for the equipment and as a sundries storage cabinet. Though of simple construction, the camera (mounted on the packing-case-cum-bench) was accurate and produced negatives up to 12 × 15 inches. It had a range of × 2 reductions and × 2 enlargements and visual focusing was employed. Autoscreen film had to be used for halftone reproductions. The copyholder was of the glass-fronted pressure type and outwardly looked nothing more, but it served other purposes as well. By removal of the baseboard, the glass front could be steadied at an angle as a working surface for retouching negatives, the tungsten copy lamps providing the back lighting. In another role, the copyholder was laid horizontally for printing-down negatives to machine plates: a perfect contact between the two being assured by pressure clips. When printing-down, a tungsten-ballasted mercury vapour lamp was suspended above the copyholder. And to complete the Repro Unit, a hand whirler was concealed in a tray beneath the camera body: the latter being pushed to its foremost position to allow access. Plates up to a maximum of $14\frac{1}{2} \times 17\frac{3}{4}$ inches could be processed on the whirling and printing-down components.

Immediate success attended the launching of the 'Lithotex' Repro Unit (Mark 1), and Pictorial Machinery followed it up with a bigger Mark 2 model in 1957. In essence, the underlying principle remained unchanged, but the construction of the equipment more closely simulated that for larger formats and the operational techniques altered accordingly. The maximum negative size was increased to 18 × 22 inches and the plate size to 21 × 25 inches for whirling and 26 × 32 inches for printing-down. With the advent of presensitised plates, the whirler tended to diminish in significance. Technical refinements extended to scale focusing on the camera and to vacuum for the copyholder-cum-printing-down-frame. Similarly, the whirler housing was made more accessible and in no way dependent upon the positioning of the camera body. Clearly the market appreciated the greater degree of sophistication because more than 260 Repro Units of the Mark 2 pattern were sold between 1957 and 1969.

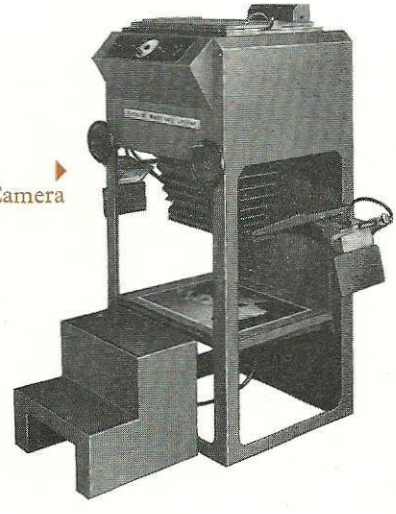


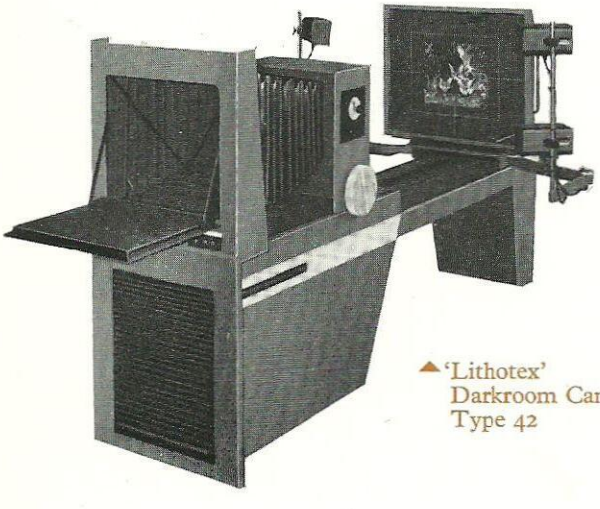
'Lithotex'
Precision Darkroom Camera
Types 38 & 39



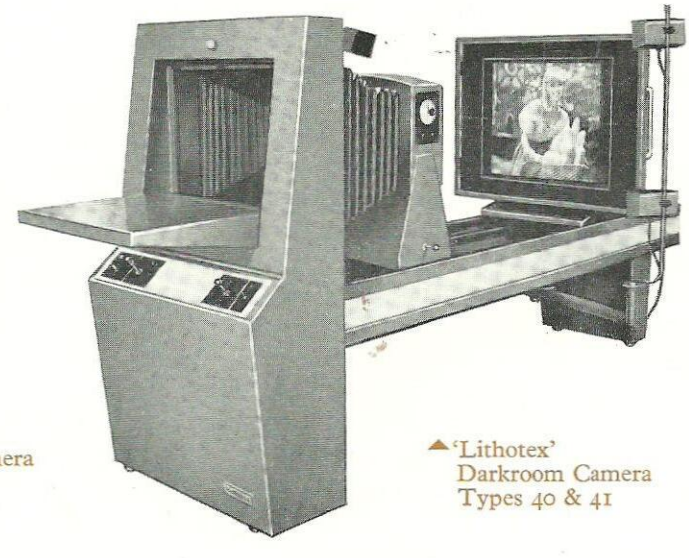
▲'Lithotex' Roll Film Camera
Types 44 & 45

'Lithotex'
Vertical Camera
Type 24





▲'Lithotex'
Darkroom Camera
Type 42



▲'Lithotex'
Darkroom Camera
Types 40 & 41

Platemaking Processes and Chemicals

From the beginnings of Pictorial Machinery in 1919, the sale of photographic and platemaking chemicals constituted a lucrative adjunct to the main business of manufacturing and supplying photomechanical equipment. As time passed, so the chemical supply section gained a major degree of importance, made bigger contributions to the company's turnover, and eventually warranted in 1947 the formation of a subsidiary organisation known as Pictorial Machinery (Chemicals) Ltd.

F. T. Corkett, as shown elsewhere in the *Recorder*, was a man with remarkable technical foresight, who possessed an inventive and imaginative turn of mind that encouraged him to experiment on the thresholds of photomechanical knowledge. His profound grasp of equipment in this sphere was supplemented by a keen and intelligent interest in the photographic and platemaking processes.

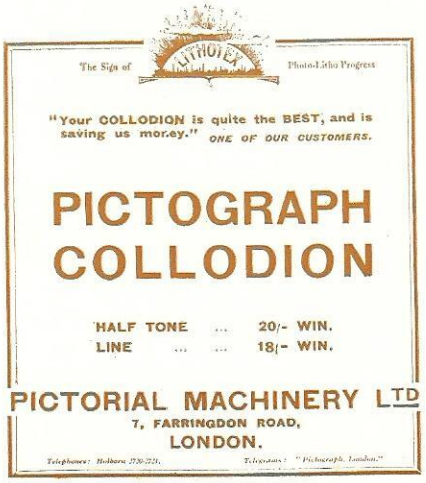
Perhaps his most precocious invention was a deep-etch process of lithographic platemaking patented in 1921, which anticipated the commercial use of such plates by at least seven years. Dr Bekk of Germany, the generally credited inventor, did not publish his work until 1928. Admittedly Corkett's methods differed considerably from those of Bekk which were to provide the foundation of the modern process, but the principle was identical – a slightly recessed image for durability on the run and good ink film thickness. From a somewhat sketchy patent specification, the Corkett deep-etch process appears to have been negative working and did not employ photomechanical *reversal* techniques as the Vandyke process of 1901 or the Bekk process of 1928.

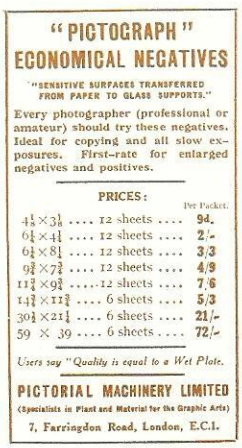
Seemingly the process began by establishing the lithographic image on the plate in a greasy ink, almost certainly by well-tried albumen or autographic techniques. Afterwards the plate was coated with an acid-resist (such as dragon's blood in alcohol), which settled in the non-printing areas but was rejected by the greasy image. When the resist had dried, the ink was removed from the image areas by a suitable solvent leaving the bare metal underneath exposed for a shallow etch by nitric acid for zinc or by hydrofluoric acid for aluminium. On completion of the etching, the image was inked-up and the resist dispersed from the plate. Differences from the Bekk and other processes of the late 1920s are not difficult to recognise, perhaps the most noticeable being that the etching stencil was not formed by exposure to light beneath a positive. Nonetheless, F. T. Corkett can lay claim to having adumbrated the principle of modern deep-etch platemaking well before anyone else.

Another platemaking process invented by Pictorial Machinery seems to have followed close on the heels of the deep-etch venture. It was promoted quite vigorously in 1923 under various names, like the 'Chromo-Lithotex' Continuous-Tone Photolithographic Process, the 'Printex' Continuous-Tone Photo-Litho Process, and the more popular 'Pictograph' Continuous-Tone Photo-Litho Process. Little is known about the method, except that a regular grating or halftone screen was not used for achieving tonal renderings. Apparently a continuous-tone negative was printed-down to a zinc or aluminium plate, presumably sensitised with a bichromated colloid that became the actual printing surface after exposure and development. In some ways the method must have been akin to collotype, but processed on a metal plate instead of on a glass base to allow for rotary printing.

The history of the photomechanical processes is strewn with abortive attempts to reproduce tone subjects without a mechanical screen, such as the old bitumen processes, the transfer of collotype prints for lithographic printing, and the use of irregular grain screens. Quite obviously, the 'Pictograph' continuous-tone technique did not prove to be an exception and failed like so many others before. Everything was tried in an endeavour to promote the process. Fidelity and purity of tones were extolled virtues, while the durability of the plates was reckoned to equal any other photolithographic images. But it was all to no avail.

Apart from supplying the know-how and chemicals for complete platemaking processes, Pictorial Machinery were actively selling other accessories in the first half of the 1920s. Considerable effort was spent on promoting 'Pictograph' Economical Process Negatives in 1921 and 1922, which were described in





one advertisement as 'sensitive surfaces transferred from paper to glass supports'. 'Pictograph' collodion for making wet photographic plates was also vigorously promoted in 1924 and 1925. Without doubt, it must have been cheaper than competitive makes and the uniformity from batch to batch was guaranteed.

By 1926, Pictorial Machinery had extended their stock of chemicals and attendant advisory service to customers quite markedly, so much so that a qualified chemist, Leslie Linzell, was engaged. To his scientific and analytical mind, the empiricism and folk-lore surrounding the preparation of platemaking formulae in the 1920s must have been complete anathema. At that time the concoctions used for platemaking were frequently devised by individual craftsmen who boasted of secret additives supposedly having some meritorious effect on the finished product. A. W. Perry recalls that albumen plate coatings were commonly mixed from the whites of fresh eggs, the raw yolks being swallowed by the operatives without so much as a wince. He remembers, also, that urine was not an unusual ingredient of platemaking chemicals, though no one really stopped to rationalise the practice. Scientists, like Linzell, did pause to think and set about explaining and systematising the whole chemical basis of photolithography.

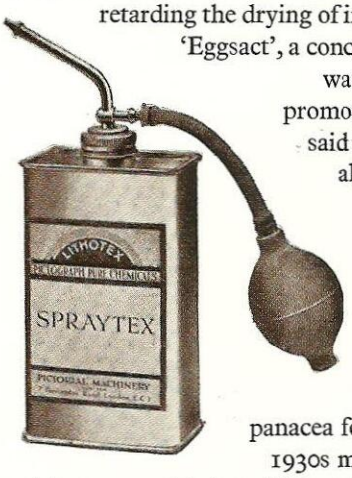
His views on pet formulae were reported in *The British and Colonial Printer* of 12 March 1931. 'One of the things that has been the biggest mystery in the trade is the coating solution. All said and done, coating solution is white of egg and bichromate (he later admits to the need for a certain amount of ammonia). As we can't all afford fresh eggs, we use dried albumen, which amounts to the same thing. I have, I think, over 100 secret formulae for coating solutions, given to me in complete confidence. I have not tried all of them out, but I have tried an enormous number of them, including all the major varieties, and as far as I can find there doesn't seem any advantage in making additions. People add many curious things to coating solutions, fish glue, carpenter's glue, alcohol, salt, and a host of others.'

With Linzell having increasing influence inside the company, the chemical supplies division of Pictorial Machinery grew rapidly. In a brochure of 1930, the centre spread listed some 120 chemicals for process photography and platemaking that ranged in price from 2*d*. (for a pound of powdered alum) to 84*s*. (for 1 cwt of magnesia blocks). The front page was devoted to collodion and zinc, and the back page to Agfa plates and films, a three-year agency for which had been obtained the previous year.

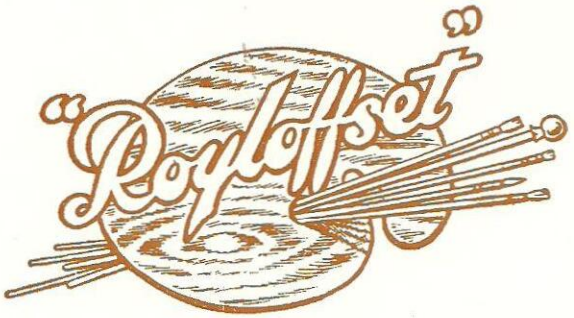
After the publication of Bekk's work in 1928, the number of deep-etch lithographic platemaking processes gradually multiplied and by 1930 several were on the market. All of them embodied the same principle, but each one tended to utilise different formulae for the plate coating, for image development, and for the shallow etch. Pictorial Machinery did not ignore the general pattern of trading and in the spring of 1930 announced to the press the 'Royloffset' Deep-Etch Intaglio Photo-Litho Process. It was advertised as a process 'exceedingly simple to operate' and requiring 'no special plant or apparatus . . . and no secret preparations'. It appears to have been one of the first to employ a lacquer base – or its equivalent – for keying the image firmly to the etched metal. Good ink coverage, durability of the image, and consistency of quality over a long run were all qualities claimed for it.

Early in 1931, Pictorial Machinery released details of a 'Lithotex' Developing Ink: a product from the fertile mind of Linzell. It was a *liquid* developing ink that could be applied with a swab to a photolithographic plate after exposure and prior to development. Hitherto, the practice had been to roll-up the plates with a stiff ink, but semi-liquid concoctions had been tried by reducing mixtures of transfer and printing inks with turpentine. Though Linzell's ink was the first of its kind to come from a British supply house, the original concept belonged to the Americans. It proved to be a good line of business for Pictorial Machinery.

With the passage of time, so the number and variety of chemicals and accessories offered by the company increased. In 1932, 'Spraytex' was announced to the industry as a compound for retarding the drying of ink on press rollers and ducts. 'Eggsact', a concentrated liquid egg albumen, was another product vigorously promoted during the 1930s and was said to be 'purer than dehydrated albumen'. At about the same time, Pictorial Machinery were appointed the sole selling agents for Olkol, a product made by F. W. Hampshire & Co. Ltd of Sunnydale, Derby, which appears to have been a panacea for press troubles. During the 1930s more and more chemicals and sundries were added to Pictorial Machinery's range, and it was not long before the turnover from this part of the business almost equalled (and in some years surpassed) that for photomechanical equipment.



In 1955, The Monotype Corporation took over the engineering interests only of Pictorial Machinery Ltd, while Pictorial Machinery (Chemicals) Ltd continued trading as an autonomous and quite separate body. Owing to the similarity of names, no longer desirable, the chemical and accessories business became Pictograph Ltd.



Powderless Etching

Etching machines did not figure prominently in Pictorial Machinery's range of equipment until 1957 saw the advent of powderless etching. Before that time, the sales representatives of the company were generally obliged to offer a machine made by some other firm.

There were one or two occasions in the company's history when the course of events looked like changing, but the interest or project seemed to fizzle out at a crucial stage to leave no lasting effect. For example, the *British and Colonial Printer* of 17 January 1924 reported the technical impressions gathered by F. T. Corkett on a visit to the USA, and electrolytic etching appeared among them. He was impressed by the Edgor electric etching machine that produced relief plates by essentially reversing the well-known electro-deposition process. Corkett was said to have been struck by the lessening of lateral etching that attended the process. In fact, the electrolytic etching of plates never caught on to any great extent, though *The British Printer* for September-October 1930 noted that Pictorial Machinery 'offered an excellent machine to the trade'.

V. Siviter Smith & Co. Ltd of Birmingham produced the first commercial powderless-etched plate in the United Kingdom on 5 April 1955. It was etched in magnesium on a machine made by Birmetals Ltd. Both the chemical and mechanical aspects of the powderless etching process had been conceived by the Dow Chemical Company in the USA with the emphasis solely on the use of magnesium: a metal with many virtues, but with the serious drawback of a fire risk that meant radical and expensive changes in plate-finishing techniques. There were other disadvantages as well, but none quite so serious.

Whispers heard by E. O. Corkett while on another visit to the USA suggested that experiments with powderless etching on zinc had reached an advanced stage and subsequent investigations led him to J. Dirats & Co. Inc. of Westfield, Massachusetts and to a meeting of mutual interests. Dirats needed a firm of photomechanical engineers to build a machine for their zinc process and to look after their marketing interests outside America. At the same time, E. O. Corkett recognised that the successful powderless etching of zinc would signal a technical breakthrough and popularise the process.

At that time, Dirats believed that the powderless etching of zinc did not infringe the Dow chemical patents, so that an agreement was concluded by Pictorial Machinery to go ahead with the building of an etching machine based on American drawings. Accordingly the machine, together with the zinc process, was demonstrated at the Lausanne exhibition in 1957. Soon afterwards, a legal tussle developed over the patents, the Dow Chemical Company claiming that the zinc process did encroach on their rights, an assertion that was later upheld.

In due course an agreement was reached between the various parties and this was reported in *The British Printer* (October 1958). 'A period of some confusion during recent months regarding the relative roles of the Dow and Dirats powderless etching systems and the use of magnesium alloy and microzinc in process engraving has been largely resolved by the announcement that both machines will be superseded by a new model to be manufactured by Pictorial Machinery Ltd and to be known as a 'Lithotex' Powderless Etcher for the Dow-Etch and Dirats processes for magnesium and zinc. It will be basically the same as the Dirats, but with the addition of paddles as used on Dow machines.

'An agreement between The Monotype Corporation Ltd (the parent company of Pictorial Machinery Ltd) and the Dow Chemical Company authorises Monotype and its associated firms to manufacture and sell powderless etching machines and chemicals covered by the Dow patents . . . '

With the legal arguments amicably settled, the powderless etching process was on the launching pad, and the perfection of the technique on zinc cleared the way for widespread commercial adoption. At the time of the Lausanne exhibition, the number of powderless etching machines sold in Europe scarcely reached a score, but within a few years Pictorial Machinery were to transform the photoengraving scene. Powderless etching marked a tremendous improvement over the long-winded handicraft methods of four-way powdering with dragon's blood and established process engraving on a scientific footing.

The original 'Lithotex' machine (24 × 24 inches), built according to American designs, was introduced in 1957 and continued until 1961 when it was replaced by the Mark IA machine (subsequently Type 101) for plates up to 21 × 26 inches and with a bath capacity of 80 litres. Two years previously, a Mark 2 model (subsequently Type 106) was introduced which processed the same size plates, but had the larger bath capacity of 210 litres, sufficient to meet the daily requirements of engravers with heavy work loads. These machines, derived from the 1957 version, employ rotating paddles to splash the etchant against the plate surface. Paddle speeds, temperature of the bath, duration of etch, etc., are all automatically determined by pre-set controls.

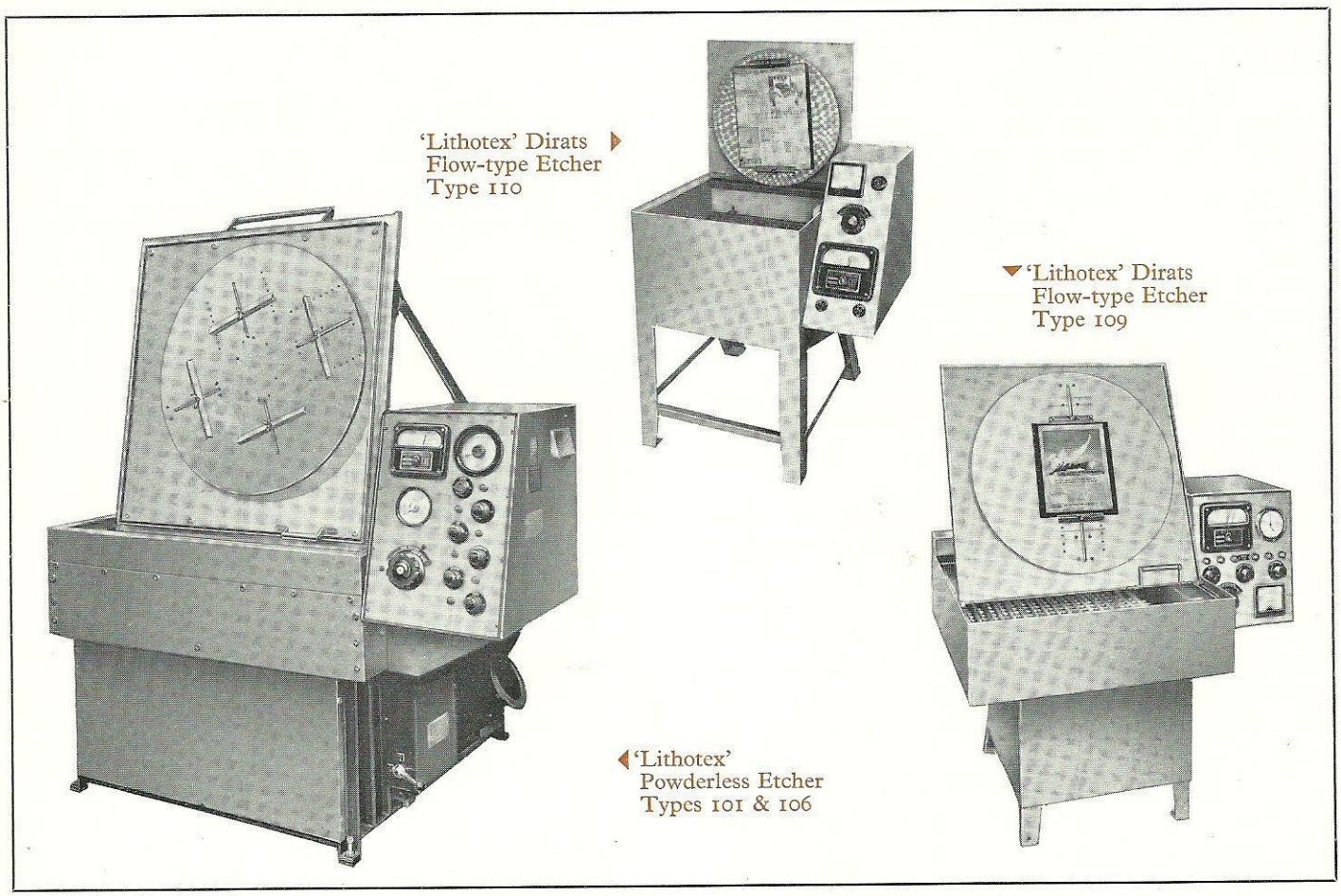
The year 1961 saw the introduction of the first 'Lithotex' machines to utilise spray jets, instead of rotating paddles, for

applying the etchant. Two machines were brought out during that year, a 'Lithotex' Dirats Flow-Type Powderless Etching Machine (Type 109) for plates up to 16 × 20 inches and a 'Lithotex' Dirats Flow-Type Powderless Etching Machine (Type 108) for plates up to 15 × 18 inches. There was no technical necessity for two machines with such closely similar capacities, but a working rule in the United Kingdom decreed that two men must operate machines over 15 × 18 inches, while smaller machines could be worked by one man alone. In 1965, the two-man requirement was rescinded and the need for the Type 108 machine disappeared with it.

Initially, the Type 109 was directed principally at a middle range of engraving firms and at newspaper offices, but a sizeable section of the industry worked on a much smaller scale. Accordingly a Type 107 for plates up to 12 × 15 inches was released to the market in 1962, only to be replaced in the succeeding year by the cheaper Type 110 machine of comparable capacity.

Completion of the range was achieved in 1964 with the introduction of etching equipment for curved plates: a 'Lithotex' Rotary Etching Attachment for Type 109 machines and a 'Lithotex' Rotary Etching Machine (Type 104).

Many well-known names appear among the early users of 'Lithotex' powderless etching machines, such as *The Times*, Gilchrist Bros Ltd, Fleetway Printers Ltd, Sun Engraving Ltd, Art Reproduction Co. Ltd, City Engraving Co. Ltd and John Swain & Son Ltd. Their number was to swell rapidly, as the sale of nearly 1,000 machines testifies, and Pictorial Machinery were established for the first time as major suppliers of etching machines – characteristically with an innovation that revolutionised the process engraving trade.



'Lithotex' Dirats Flow-type Etcher Type 110

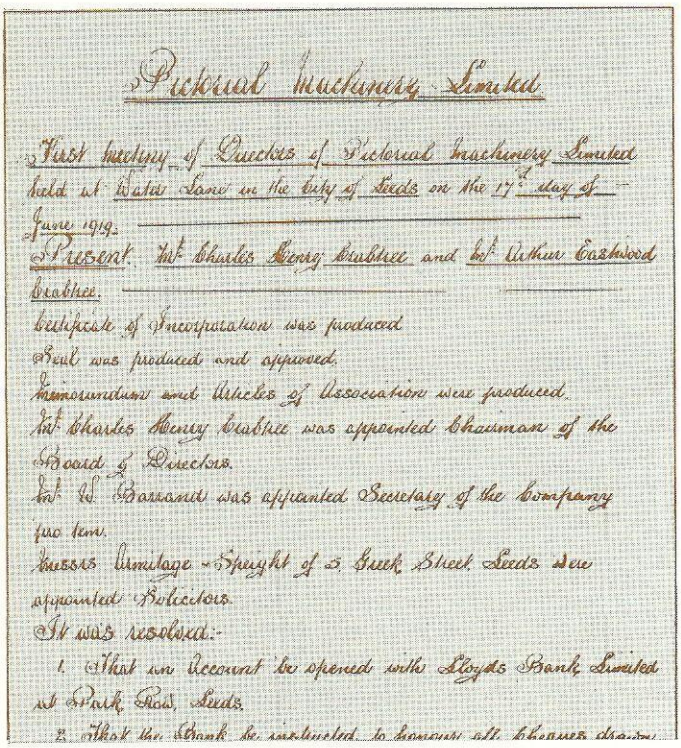
'Lithotex' Dirats Flow-type Etcher Type 109

'Lithotex' Powderless Etcher Types 101 & 106

The Company

1919–1939

Pictorial Machinery Limited was registered as a private company, with an authorised capital of £16,050, on 20 May 1919. The Memorandum of Association stated that its objects, inter alia, were to take over Lithotex Limited as a going concern, together with patent rights, etc. The first Board meeting was held



Pictorial Machinery Limited

First meeting of Directors of Pictorial Machinery Limited held at Water Lane in the City of Leeds on the 17th day of June 1919.

Present: Mr. Charles Henry Crabtree and Mr. Arthur Eastwood Crabtree.

Certificate of Incorporation was produced

Seal was produced and approved.

Memorandum and Articles of Association were produced

Mr. Charles Henry Crabtree was appointed Chairman of the Board of Directors.

Mr. H. Boswell was appointed Secretary of the Company pro tem.

Messrs Umbleby & Speight of 3 Park Street Leeds were appointed Solicitors.

It was resolved:-

1. That an Account be opened with Lloyds Bank Limited at Park Row Leeds

2. That the Bank be instructed to honour all Cheques drawn

at Water Lane, Leeds, on 17 June, and was attended by C. H. Crabtree (who was appointed chairman) and A. E. Crabtree. Frederic Corkett attended a Board meeting in July, and six months later his name appears in the Board meeting minutes as managing director.

The first registered office of the company was 10 Serjeants' Inn, Fleet Street, London EC4; but by December it had moved to Crabtree's London office at 7 Farringdon Road, all the office equipment being transported in a single taxi. Additional space was leased both in 1923 and in 1928, for use as showrooms and offices.

In the early years, 'Lithotex' equipment was both sold outright and let out on lease. In an advertisement in 1921, a complete 'Lithotex' plant, including the step-and-repeat machine, was offered for sale at £3,300 – or for hire at 'the very low pre-war rate of £300 per annum'; a later advertisement offered a system of deferred payments. By mid-1923 Pictorial Machinery could claim to have some three dozen customers, including the following well-known firms and organisations: The Amalgamated Press Ltd; The Bank of England; Barclay & Fry Ltd; Blades, East & Blades Ltd; Eyre & Spottiswoode Ltd; Forman & Sons Ltd; Lever Brothers Ltd; Nickeloid Electrotype Co. Ltd; William Sessions Ltd; Singer Manufacturing Co. Ltd; John Swain & Sons Ltd; Tillotsons (Liverpool) Ltd; John Waddington Ltd.

1924 was a particularly busy year, with a gratifying flood of enquiries, demonstrations and orders. Frederic Corkett visited America for the tenth time and he carried out a comprehensive tour of existing and potential customers. His term of service as managing director was extended for a further five years, with the understanding that foreign business would be his special responsibility. His younger son, Erik O. Corkett (right), who had been with the company for three years, was appointed to the

Board, and the following year, his elder son, John F. L. Corkett (left), who had gained his B.SC. degree at King's College, London, was also made a director. Of the staff who joined in the 1920s, two men in particular made significant contributions to the company's success: Leslie Linzell, on the chemical and processing side, and Andrew W. Perry (until recently Pictorial Machinery's London representative) on the engineering side.

There was certainly no lack of foreign interest in Pictorial Machinery's products from the start. The first step-and-repeat machines to be delivered represented orders from Australia, Belgium, Egypt, Germany, Holland, Italy, Shanghai and the United States. Continental activity was particularly brisk,

offices were opened in various cities, and the company took space at trade exhibitions. Frederic Corkett described how, at the 1926 Leipzig Fair, 'the machines were working and demonstrating and making plates practically all the time . . . At ten on Saturday night, when the show was otherwise empty, there were still thirty people at our stand, and we had to close down from sheer exhaustion.'

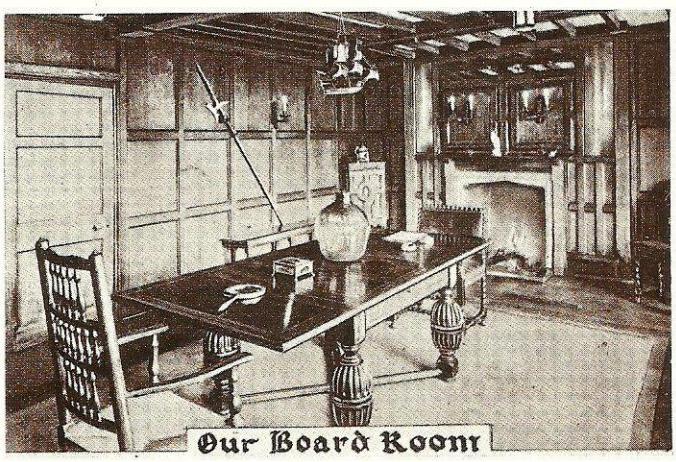
At this exhibition, he made contact with two textile industrialists from Hungary, Albert Jossua and his son, Richard. With the former he started a Swiss holding company, Cylindrotex S.A., to deal with the company's business overseas. When the Crabtrees resigned from the Board in 1928, their shares were transferred to the three Corketts, and subsequently some of these shares were further transferred to A. Jossua et Cie. In 1929, the capital of Pictorial Machinery was increased to £27,250, and more shares were issued to A. Jossua et Cie.

In December 1930, an era came to an end. Frederic Corkett retired from active participation in the business. At the age of 64, with the company successfully established and its products respected throughout the world, he was content to hand over his leadership to his two sons, Erik (subsequently managing director) and John, who were concerned respectively with the commercial and technical sides of the organisation. However, by remaining on the Board, he kept in touch with developments. He died in January 1940, following a short illness, at his home in Eastbourne, Sussex; after cremation, his ashes were scattered over his native Buckinghamshire.

In June 1933, Pictorial Machinery moved from Farringdon Road to larger premises at 47 & 49 Hatton Garden, London EC1.

Historical Associations of No. 47

After a life of 14 years Pictorial Machinery Ltd. has changed its home to 47 Hatton Garden —from the costers, fruit and book stalls and marketing folk of Farringdon Road to the diamond merchants of Hatton Garden with their Jewel parcels and magnifying glasses. Every foot of Farringdon Road, indeed of all the City of London, has history largely written upon it, and Hatton Garden also, no less than any part of our ancient city. It was here on the site of the shops of Hatton Garden, and in Ely Place adjoining, that Sir Christopher Hatton had his residence and grounds. Christopher Hatton was one of the "bright young people" of the brave days of Queen Elizabeth, and so took Her Majesty's eye when he appeared in a play before her that she quickly made him (in 1572) Captain of her Bodyguard. Queen Bess was then 39 and he 32. He received astonishingly quick promotion, was knighted 6 years thereafter, and then Elizabeth made him, much to everyone's astonishment, Lord Chancellor of All England. Sir Christopher Hatton was always a great man with Queen Elizabeth. He died in 1591, was buried in St. Paul's Cathedral, and folks did say, so says the Old Chronicler, "that Sir Christopher had at last discovered her


Our Board Room

The ground floor at No. 49 and the first floor at No. 47 were given over to workshops; the upper storeys contained the offices, showrooms, instructional section and the experimental laboratory; and the basement was used for storing the extensive supply of chemicals. Business prospered, but, because the attempt to foster a world-wide interest in the application of 'Lithotex' plant to the textile trade had not succeeded, Jossua's interest in the company waned. Frederic repurchased the Jossua shares and divided them between his sons, so that the family was virtually for the first time in undisputed control of the company.

During the 1930s Pictorial Machinery was carrying out an increasing amount of work for the Ordnance Survey, supplying cameras, arc lamps, whirlers and printing-down frames for use in the field. At the same time, the Admiralty needed equipment for chart-making, and the War Office, working independently of the Ordnance Survey, also placed special orders. The shadows of 1939 were already being detected, and extra space had to be taken for the work at 53 Hatton Garden.

1939–1945

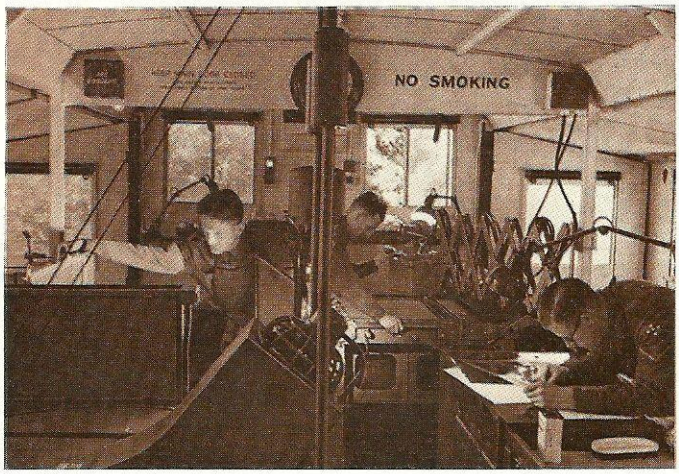
For the first year of the Second World War, Pictorial Machinery's production was not greatly affected. What equipment did not go direct to government departments was routed to printers engaged on government work. In the ordinary commercial world, operators were thankful for machines that were robust enough to maintain working accuracy without the need for regular service or replacement parts; for the supply of both was to dwindle away to nothing in the ensuing years.

A great disaster happened on the night of 9–10 October 1940, when the whole Hatton Garden establishment was wiped out by incendiary bombs, fortunately without loss of life. The following morning, only the shell of the building and a heap of smouldering rubble remained; firemen were still plying their hoses, and employees, arriving for work, stood dumbfounded. One designer was shocked beyond control and stood near the ruins moaning 'What can we do? What can we do?', as the tears ran down his face. Erik Corkett philosophically summed up the situation by saying, 'Well, I'm going to get a cup of coffee'.

As all three of the fighting services were making extensive use of Pictorial Machinery's equipment, influences were brought to

bear on means for restarting production with the minimum of delay. Wartime London presented few facilities for re-establishing an integrated manufacturing business, and so for the next few years production was hampered by the smallness and multiplicity of sites. Premises were requisitioned in the King's Cross area, but scarcely had Pictorial Machinery occupied them when they received a direct hit. Manufacturing and office space was next secured in a garage in High Street, Highgate, and a girls' school, just across the road, was also taken over and occupied until 1947. A garage at Hornsey served for the equipping of army lorries with mobile plant and for training military personnel in its use. The chemical supply section was housed in Palmer's Green. These and smaller places – a room here, a shed there and some stables down the road – were the hole-and-corner substitutes for a factory, thus making production a nightmare.

Nevertheless, a diverse range of equipment was designed and built to meet the needs of war. For the Ministry of Information, a dozen lorries were prepared for service in the Far East, each containing a small vertical camera, whirler, printing-down



frame, darkroom equipment, a Varityper and a Multilith machine. More of the small vertical cameras were also supplied to the Ministry for use in their static printing units – the first examples of *small-offset* cameras. Supplied to survey units of the Royal Engineers were 86 vehicles fully equipped with printing-down plant; another 28 were fitted out as darkrooms and the same number as complete mobile camera installations.

The Admiralty commissioned Pictorial Machinery to build an Auto-Focus Enlarger Camera for map and chart reproduction by unskilled female labour, and 28 of this model were supplied. Additionally, 411 microfilm viewers were manufactured for the same authority.

So that aerial reconnaissance photographs could be processed without delay, a number of vehicles were supplied to the Royal Air Force: some fitted up as darkrooms and some with bromide-printing equipment. Furthermore, the 'E' bromide printer, for speeding up the processing of aerial surveys, became virtually the standard equipment of most Allied Air Forces both during and after the war; and it played no small part in the planning of the invasion of Europe.

1945–1955

With the return of peace, Pictorial Machinery were obliged to move from Highgate, and in 1947 the Admiralty helped them find accommodation for their main workshop in the Watford factory of S. G. Brown Ltd. At the same time, the offices were transferred to 37–39 Oxford Street, London W1.

Meanwhile, the Board decided that it was desirable to form two subsidiary companies. Accordingly, Pictorial Machinery (Engineers) Ltd was constituted to act as a manufacturing unit, and Pictorial Machinery (Chemicals) Ltd to handle the supply of chemicals from premises in New Barnet. The latter company was later renamed Pictograph Ltd and was eventually purchased by Johnsons of Hendon Ltd.

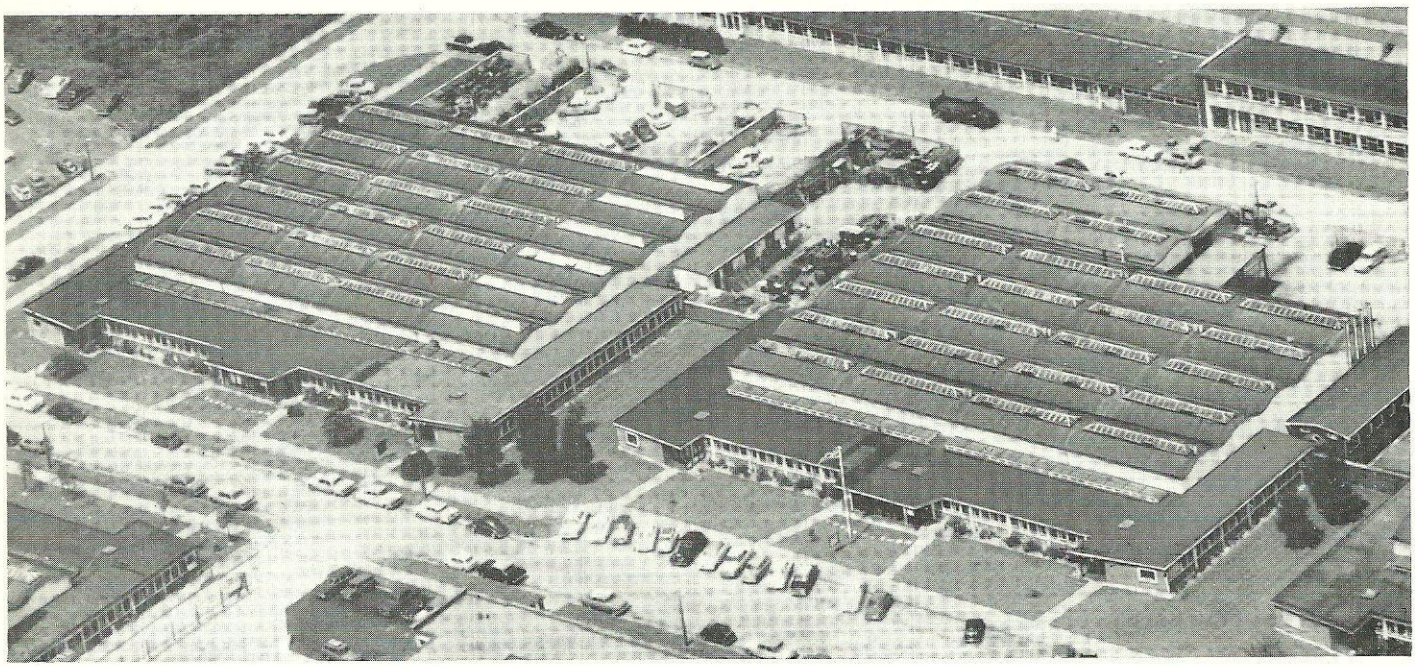
Instruction in the use of Pictorial Machinery's equipment had always been a feature of the company's activities. Now that men were being released from the forces, there were increasing scope and need for tuition. The search for suitable accommodation ended in Wardour Street, London W1, where a training centre was established early in 1949, offering intensive one-week courses for executives and two-week courses for operatives.

The move out to Watford was not a happy one, for very soon Pictorial Machinery's need for more manufacturing space coincided with increased Admiralty work stimulated by the war in Korea. As an emergency make-shift, the site of Hendon Vegetable Market was taken over; but, to make it usable, £2,000 had to be spent on the replacement of glass! This was a particularly frustrating move, since plans for a permanent and coherent factory were still only in the embryonic stage.

Moreover, the company was now manufacturing many of its machine components, whereas previously it had done little more than assemble the items obtained from a large number of suppliers and test the appliances before despatch. Drummond Brothers Ltd, the Guildford engineers, who had had considerable experience in manufacturing for Pictorial Machinery since the early days, now had their own post-war problems. Vickers Ltd of Crayford were fortunately in a position to build a certain number of the specialised machines, and several other small concerns did their best to make good the remaining deficiencies.

In considering a suitable site for a new factory, the brothers Corkett studied schemes which had been drawn up for industrial estates at Harlow and Crawley. The latter was favoured and, when authoritative influence was brought to bear, Pictorial Machinery was quickly allocated a single-storey modern building of 29,000 square feet on a 21-year lease. The engineering section moved in during the week-end of the August bank holiday in 1953, and the head office – no longer a single taxi-load – followed 11 months later when the Oxford Street lease expired.

Customer demands at this time were very considerable, particularly in so far as replacements and additional plant were concerned due to deficiencies during the war years. The major problem facing the company was the need to bring the new Crawley works up to its full complement, with all the tools and accessories required to cover every aspect of production. It is no wonder that capital resources came under the very severe strain of delayed war-shock. Various economies were made, and these included the closing of the Wardour Street centre.



1955–1969

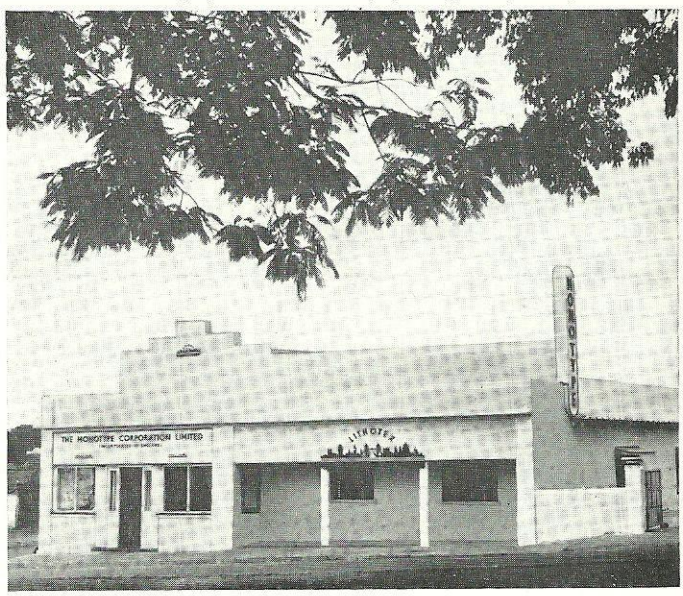
It was The Monotype Corporation Ltd that eased the pressure, and this came about partly as the result of a conversation between an Australian businessman and Monotype's secretary, Jack Matson (now managing director). For some time, the Corporation had been interested in the development and marketing of new equipment designed specifically for the lithographic trade. When the Australian suggested that it might benefit the Corporation to acquire a concern already engaged in this field, such as Pictorial Machinery, the idea was immediately taken up. A meeting was arranged between the principals of Monotype and Pictorial Machinery, and as a result the Corporation agreed to purchase all the shares of Pictorial Machinery.

In an announcement made in October 1955, it was stated that the two companies would henceforth 'be working in close association in the developing and marketing of high-precision photo-mechanical equipment . . . The arrangement ensures that the two organisations, while maintaining their separate identities, will each be able to benefit from the other's technical resources and marketing experience. Pictorial Machinery brings to the collaboration an intimate knowledge of the current problems and foreseen needs of printers in the rapidly expanding photo-litho field. Monotype brings to it exceptional engineering facilities, together with a world-wide selling and service organisation.' The past 14 years have seen this policy of co-operation carried out with the minimum of difficulties normally inherent in such mergers and with the maximum of advantages to both sides.

Very few internal changes took place at Crawley. Directors from the parent company joined Pictorial Machinery's Board, but it was agreed that Erik Corkett should continue to manage the company, assisted by his brother, John, and by his son, Derek, who had been appointed sales manager in the previous year. Five years later the brothers Corkett retired. Derek Corkett was appointed general manager (subsequently managing director), and David H. J. Schenck, the Corporation's Service A manager, was transferred to act as assistant general manager (he is now the executive director in charge of the factory).

One of the first problems Derek Corkett had to face was the difficulty of obtaining licences to import Pictorial Machinery's equipment into India. To overcome this obstacle, arrangements were made in 1961 for part of the Corporation's factory in Bangalore to be given over to the manufacture of Pictorial Machinery's products. This has proved extremely successful. Amongst the items of equipment constructed there, for local sale, are cameras, whirlers, printing-down frames, arc lamps and lining-up tables; and there is ample testimony to the fact that the quality of these products is fully up to the standards set at Crawley.

Pictorial Machinery's factories: Crawley (above), Bangalore (below)



Pictorial Machinery's chairman, Brigadier Sir George Harvie-Watt, speaking at the company's golden jubilee celebrations

Pictorial Machinery's managing director, Derek Corkett (centre), at a working session with some of the company's executives

Another important extension took place at home in the following year. Machines and techniques had been multiplying. Executives and operators were just as keen to learn about them as Pictorial Machinery were to spread the knowledge of the new developments and appliances. For this purpose, a two-storey building was leased at Brockley, in south-east London, where a full range of cameras, step-and-repeat machines, whirlers, printing-down machines, etc. was assembled, with ample working space and facilities for practical instruction and theoretical lectures. In November 1962, the new Instructional Training Centre opened, with the late Frank Smith, F.R.P.S., F.I.O.P., as its first principal (he was succeeded by Peter Missenden, who had joined the company in its Highgate days). After seven years at Brockley, the Centre was transferred to Crawley as part of the company's unification plan.

The technical developments of Pictorial Machinery during the past 14 years are described elsewhere in this issue of the *Recorder*. They make an impressive record, but equally impressive is the great expansion of the company's business, particularly in the overseas market. The steady increase in orders has necessitated an enlargement of the Crawley works: an extension to the existing factory was built in 1963, and in 1967 additional accommodation was taken in a neighbouring factory, bringing the total floor area up to over 40,000 square feet.

Some notion of the fertile and imaginative design thinking that still resides within Pictorial Machinery at Crawley can be gained from the latest catalogue of appliances. Around 60 different models of 'Lithotex' equipment are currently in production and some 40 of them have been designed within the last 10 years. Well over half of the remaining one-third have undergone improvement since 1959. Perhaps the greatest strides forward have been seen in the design of 'Lithotex' cameras, none of the current nine models having been in production before 1963. Similarly, the degrees and constancy of accuracy possible with 'Lithotex' and 'Lithoprintex' step-and-repeat machines have set entirely new standards. Of the five current models, three were launched in the present decade and the other two date only from the middle 1950s. Powderless etching machines have been another great source of business to emerge recently with five of the six current models less than eight years old. All the models of whirlers, temperature-controlled sinks, fume extraction tables, and processing sinks first appeared in the 1960s; and seven of the 12 models of vacuum frames were improved in the 1960s.

Fifty years have seen the complete transformation of the company from a man, an office and an idea into a manufacturing concern where 200 people are employed and with representatives in nearly every country in the world. The story started with a boy making a camera with a lens from a telescope; his amateur hobby has developed out into every sphere of photomechanical reproduction and has helped to revolutionise the graphic arts industry. This commemoration of the company's golden jubilee is merely an interlude in the story, a moment in which to reflect upon the achievements of yesterday before advancing to the technical projects of tomorrow.

This issue of The Monotype Recorder *is the joint work of A. P. Squire and L. W. Wallis, the former being responsible for the history of Pictorial Machinery and its founder, the latter for the review of technical developments. Valuable assistance was given to them in their researches by past and present members of Pictorial Machinery, particularly E. O. Corkett and J. F. L. Corkett.*