in the end discovering that he has been completely anticipated. The Comptroller of Patents causes a search to be made through British specifications for fifty years back from the date of every application for a patent. Only complete specifications, either after provisional, or complete in the first instance, are subject to the search, and the Comptroller has the power to insist on the amendment of the specification or on the insertion of a reference to existing patents, and so to place it in interference therewith. A preliminary and independent search by the inventor before filing a complete specification often reveals prior applications with which he may be able to avoid clashing by means of judicious wording in his complete specification, thus obviating the addition of troublesome references to prior patents—references which are likely to discount the value of his patent.

A sealed Royal Letters Patent alone enables an inventor to obtain absolute protection for fourteen years, and allows of legal action being taken against infringers, annual renewal fees being payable from the end of the fourth year.

The complete specification must be begun upon Patent Form No. 3 (stamp, £3), and continued on foolscap paper. An unstamped duplicate copy is also required. The specification should contain a full and detailed description of the invention, of such a nature that the invention could be carried into practical effect by a competent workman. Drawings are also required where a mere description would fail to make everything absolutely clear. Instructions to applicants for patents (supplied free) give clear directions not only for drawings but also for the mode of applications, provisional and complete. The complete specification, together with its claims, is a most important document. The drafting of claims is a task that should be done by a fully qualified and registered patent agent, because when a specification comes to be construed in a court of law, the wording of the claims is subjected to a searching scrutiny, and if there is any flaw the patentee will generally fail to support his monopoly. Further than this, the claims should always be drafted in the first instance as wide as is reasonably possible, because there will then be an opportunity of reconsidering them in the light of the fuller knowledge of prior patents disclosed by the Patent Office search.

The total amount of Government stamp duty for a British patent is £1 on provisional application, £3 on completing same; or £4 on complete application in the first instance. A further fee of £1 is payable in order to obtain the issue of a patent on an accepted application. Before the end of the fourth year, dating from the first application, £5 becomes due in respect of the fifth year; before the end of the fifth year £6 in respect to the sixth year, and so on, increasing £1 each year during the period (fourteen years) the patent may be kept in force. The period is extended only in very special circumstances.

PAUL'S ANIMATOGRAPH

One of the earliest commercial kinematograph machines, patented by R. W. Paul, and at first called the "Theatrograph."

PAYNETYPE

A photo-mechanical process invented by Arthur Payne. Zinc plates are coated with a gelatino-bromide emulsion and exposed direct in the camera. In order to obtain the necessary reversal of the negative image the plate is coated, before the application of the emulsion, with a resinous varnish. After exposure and development with an alkaline developer, the image is treated with a 5 per cent. solution of potassium bichromate, which hardens the image so that it can be developed with hot water, like a carbon print. Thus the soluble gelatine forming the half-tone dots or lines of the negative image is washed away, leaving the varnish ground clear in those parts. The plate is then dried and immersed in methylated spirit, which dissolves the varnish in the places uncovered by the gelatine, the zinc thus being left bare. A coating of ink is next applied and attaches itself to the bare zinc, whilst it can be developed away in the parts which are still covered with varnish and gelatine. The plate is then ready for the etching process.

PEARL-ASH

Impure potassium carbonate.

PELLETONES

An early name for chemicals sold in a compressed form. Pyrogallic acid was the first to be sold in this way. The term has also been applied, but very rarely, to the results of the Pellet iron-printing process.

PELLET PROCESS

An iron (blue-print) process—the true cyanotype, which gives blue lines on a white ground when a copy is made from a line tracing. It is a "positive from positive" process, and unsuitable for use with ordinary negatives because negative prints would then be obtained. The process is also known by various other names, such as "Cyanofer," "Positive Ferrotype" and "Cyanographic," and is largely used for the reproduction of technical drawings. Pellet's own formula has always been kept a trade secret, but Dr. Liesegang gives the following, which answers quite well:—

Common salt . .	144 grs.	33 g.
Tartaric acid. .	156 ,,	36 ,,
Ferric chloride .	384 ,,	88 ,,
Gum arabic . . .	2·5 oz.	275 ,,
Water	10 ,,	1,000 ccs.

Dissolve the gum in one half of the water, the other ingredients in the remaining half; mix, apply to paper in the manner described under the heading "Blue-print Process," and dry quickly. An exposure, under the tracing, of one or two minutes is sufficient in bright sunlight. The print is developed by floating it face downwards on a saturated solution of potassium ferricyanide (none must reach the back of the print); then wash for a minute or two in water and immerse for about ten minutes in a clearing solution of water 100 oz., hydrochloric acid 8 oz., sulphuric acid 3 oz., finally thoroughly washing and drying.

A modern formula, due to Pizzighelli, is given on the next page

A. Pure gum arabic .	264 grs.	60·5 g.
Water . . .	3 oz.	300 ccs.
B. Ferric ammonio-citrate . .	220 grs.	50 g.
Water . . .	1 oz.	100 ccs.
C. Ferric chloride (crystals) . .	220 grs.	50 g.
Water . . .	1 oz.	100 ccs.

The gum solution does not keep well, but the others do, if stored in the dark. For sensitising paper take of—

Solution A (gum) .	2½ oz.	250 ccs.
,, B (citrate) .	1 ,,	100 ,,
,, C (chloride) .	5 drms.	1 ,,

Add B to the gum, shake well, add C, and shake again. If mixed in any other way the gum may coagulate. The paper is coated and dried like blue-print paper and exposed under a tracing. Exposure is very brief (a minute to a minute and a half in strong sunlight), the image showing faintly. The print is developed in a solution of 1 oz. of potassium ferrocyanide (yellow prussiate of potash) in 10 oz. of water. The lines should develop to a brilliant blue, without any blueness in the ground, which would indicate under-exposure; broken and feeble lines are due to over-exposure. The print is washed for a few seconds in order to remove most of the developer, and then fixed in an acid bath, sometimes called a bleaching bath, made by mixing ¾ oz. of strong sulphuric or 2 oz. of hydrochloric acid with 20 oz. of water. The prints, face upwards, remain in this bath for five or six minutes, and are then thoroughly washed. A light blue deposit is often seen upon the white parts of the paper, but this washes off, or it may be removed with a very soft brush or cotton-wool. Any blue stains (or, in fact, the whole of the image) may be removed with a solution of about 70 grs. of potassium oxalate in 1 oz. of water (4 g. in 250 ccs.), washing well afterwards. (For selection of suitable papers, method of sensitising, etc., *see* "Blue-print Process.")

PELLICLE PROCESSES

Early dry-plate processes in which the prepared emulsion was supplied for the purpose of melting up and coating plates at home. Kennett patented a pellicle (a compound consisting of gelatine, silver nitrate, bromide, etc.) in November, 1873.

PENCIL, BROMIDE

A specially prepared pencil for spotting and working-up bromide prints, for particulars of which see "Bromide Pencils."

PENCIL, RETOUCHING (*See* "Retouching.")

PENTANE (Fr. and Ger., *Pentane*)

Synonym, amyl hydride. C_5H_{12}. Molecular weight, 72. A colourless, mobile liquid, obtained from coal tar or petroleum. Boiling point, 98° to 100° F. (36·6° to 37·7° C.). Its vapour is extremely inflammable. It is used in the pentane lamp.

PENTANE LAMP

A special form of lamp adopted by the Board of Trade as a standard light. Ordinary coal gas is passed over the surface of pentane, of which it absorbs some, and thence to an Argaud burner. If precautions are taken as to the pressure and height of flame, it gives a very constant light source, which, however, is open to the objection that its spectrum is very poor in violet and ultra-violet, and therefore not comparable to daylight for photographic purposes. It is frequently known as the Dibdin-Harcourt pentane lamp, and may be obtained of either ten or one candle-power. It is used as a primary light standard for photo-chemical work.

PENTATHIONIC ACID (Fr., *Acide pentathionique*; Ger., *Pentathionsäure*)

$H_2S_5O_6$. Molecular weight, 258. One of the higher sulphur acids, of very little practical interest. Lumière and Seyewetz suggested the use of lead pentathionate dissolved in "hypo" as a toning agent instead of gold; but it has found no practical use, as the final image consists of lead, silver, and sulphur, and is somewhat liable to change.

PEPPERTYPE

A process of making ceramic enamels.

"PER CENT" SOLUTIONS (*See* "Solutions, Making up.")

PERCHROMIC ACID

A term sometimes used as a synonym for chromic acid (chromic anhydride), though the formula for perchromic acid is written $Cr_2O_7 H_2O$ and that of chromic acid is CrO_3.

PERIOD

A term proposed by Scheffer to denote the size of the units of screens and screen-plates. The period for lines equal in width to the interspaces is twice their separating distance. Thus, in the diagram, which represents a black-and-white screen of equal spacing, the period is shown at

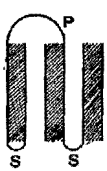

Diagram of Black-and-white Screen of Equal Spacing

the top by P; the elements of the screen are indicated at S. Any screen of which the period is $\frac{1}{1000}$ of the distance from the eye can be resolved into separate lines. From this it is obvious that, assuming 8 in. or 20 cm. as the distance of normal vision, the screen period will be $\frac{1}{1250}$ in. or $\frac{1}{50}$ mm. Therefore the separate units of the screen will be invisible if they are not larger than $\frac{1}{2500}$ in. or $\frac{1}{100}$ mm.

PERISCOPE, OR PERISCOPIC LENS

Usually an uncorrected rectilinear lens. The earliest model was made by Steinheil, in 1865, and consisted of two very thin meniscus lenses mounted closely together. It embraced a very wide angle (nearly 100°), and had an initial intensity of *f*/40. The modern periscopes are