LINOFILM

... a new concept in
photographic typesetting

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a new concept in photographic typesetting

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PHOTO-TYPESETTING

Background and Perspective

PHOTO-TYPESETTING is not new. The dream of setting type photographically has tantalized several generations of inventors. There are recorded in the United States Patent Office photo-typesetting patents dating back 80 years. Almost 25 years ago a Swiss concern lost approximately two million dollars attempting to develop and exploit a photo-typesetting machine. Within the span of these photographic activities Ottmar Mergenthaler invented the Linotype machine and revolutionized the graphic arts industry, making possible a surge in printing unparalleled since the Gutenberg era.

The Linotype assembles, spaces and justifies characters and casts by purely mechanical means. Finding ways other than purely mechanical to perform the corresponding functions in the photographic approach has been at the hearts of earlier frustrations. Not until science advanced to its present state in the fields of electro-mechanics, electronics, photography, illumination and optical physics were there available practical solutions to the basic problems.

Photo-typesetting is only one part of the photo-composing process, and photo-composing, in turn, is only one part of the whole process of taking the uncomposed word to the press in printable and legible form. The importance of photo-typesetting, now and in the future, can be gauged only in the light of the economics of the whole photo-reproductive process. Solving the photo-typesetting problem only means that one of the many problems in the photographic process is behind us.

Much remains to be done with regard to editing, correcting, make-up, handling and platemaking. Substantial development progress has been made in those areas, and the outlook for further progress is encouraging. Nevertheless, no amount of progress short of accomplished fact will produce profits for printers and publishers.

In addition to the further new mechanisms and processes required to make the entire photo-composing process an economical and efficient one in proper applications, the graphic arts industry will need new types of skills. Whatever

the limitations imposed by economics upon the applicability of the photographic process, the training problems will require the earnest concentration of those segments of the graphic arts industry that ultimately adopt photo-composing for all or a part of their work. Any thought that the photo-composing process can be adopted economically without training of personnel and the development of new skills should not be long entertained.

We have said repeatedly that the Linotype is not an indispensable machine, and never has been. Type was composed in sticks by hand for centuries before the Linotype was invented, and it can still be composed that way. The Linotype came into existence and was adopted by the printing trade because it was faster and cheaper than hand composition; it is in existence today because it is the fastest, cheapest and most versatile means of setting type of the quality required. The whole Linotype process remains in existence because, as a combined process, it is the fastest, cheapest and most facile known for taking the uncomposed word to the press in printable and legible form. For the photographic process to replace it in any area of printing, it will have to prove itself faster, cheaper and more facile in its entirety.

The economics of photo-typesetting and the whole photographic process, together with their technical and practical applicability, will gradually become more clear over the next few years. A few printers pioneering in the field have already determined certain areas of work within which photo-typesetting is practical and others within which it is not—based upon available equipment and processes. With the Linofilm and other new process devices, those pioneers and others will develop new and further facts upon which additional evaluations and estimates of potential can be based.

Present indications are that photo-typesetting will follow a normal course of evolution over a period of years, and ultimately find its proper place in the graphic arts industry along with the Linotype.
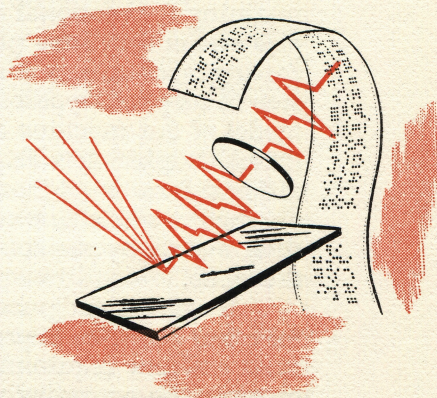
ORIGIN OF LINOFILM

DESPITE the use of many confusing terms, there are only a few basic approaches to photo-typesetting devices producing justified lines. The fundamental engineering concepts being used by the people at work in this field of photo-typesetting all fall within these general classifications:

1. The circulating matrix, or matrix handler, approach.
   (*Linotype's 1950 machine, Fotosetter, Rotofoto, Monophoto, etc.*)
2. The spinning disc, or spinning cylinder, approach.
   (*Peery, Keller-Fries, Photon, etc.*)
3. The directed-mirror approach.
   (*Klyce, Spievak, Huebner, etc.*)
4. The video tube, or pure electronic, approach.
   (*Linotype*)
5. The static character projection approach.
   (*Linofilm*)

The circulating matrix, or matrix handler, types of photo-typesetting machine have been developed through the adaptation to photography of existing hot metal casting machines, retaining conventional matrix circulating or handling principles and substituting photographic devices for the orthodox casting mechanisms. Linotype utilized this approach as a first step in its photo-typesetting research program. The research model of our machine of this type was exhibited at the National Graphic Arts Exposition held at Chicago in 1950. It differed from machines of a similar nature in that it photographed a whole line of assembled matrices at once rather than matrix by matrix. That machine was never offered to the trade.

It was our judgment that the use of a machine designed for other purposes to produce a photographic product did not meet the new requirements of photo-typesetting and would result in the preservation of certain inherent limitations that should not be carried over into a new process. At the same time we rejected the spinning disc (or spinning cylinder) and
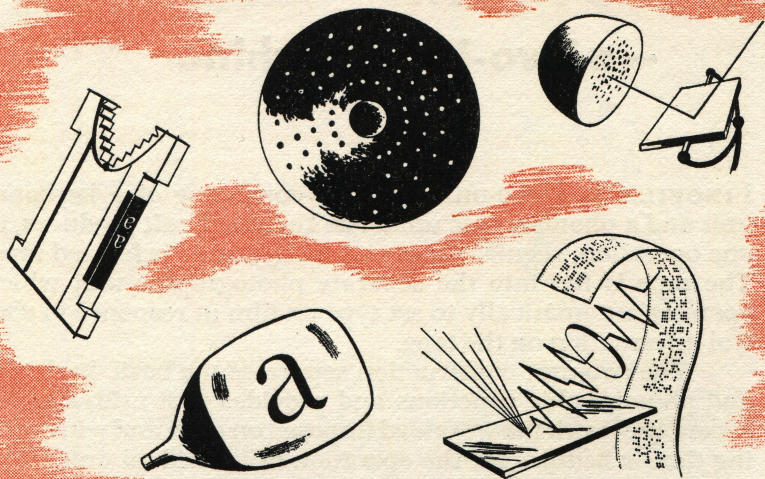
the directed-mirror approaches because our research engineers saw certain fundamental performance limitations and disadvantages in those methods of photo-typesetting.

We embarked upon a research program designed to develop a simple, practical and efficient photo-typesetting machine of original concept and without inherent performance limitations. The result of that project is the Linofilm, a completely new machine of original concept based upon a unique approach.

During the course of our research we conceived and patented another new concept which can be designated as the video tube, or pure electronic, approach to photo-typesetting. However, the subsidiary electronic component developments in this field are not yet at the level of performance required for the construction of a practical machine. While this is an interesting approach we view its reduction to practice as something which is far in the future.

LINOFILM
—a Two-Unit Machine
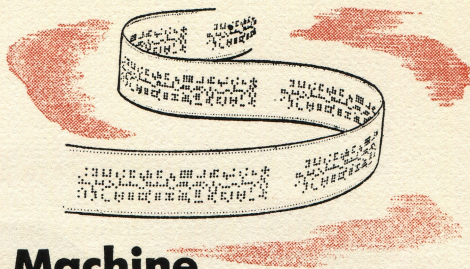
LINOFILM is a two-unit machine consisting of a keyboard unit and a photographic unit. The keyboard unit produces, in one operation, regular typewritten copy and perforated tape. The tape is fed into the separate photographic unit which operates automatically to set type on film in response to control information on the tape.

The two-unit construction separates the basic keyboard and photographic functions and provides unit utilization in accordance with the workload imposed on each and with varying time schedules for the operation of individual units. The separate units may be grouped and placed anywhere within a printing or publishing plant as best suits that particular operation, and no air conditioning is required. Each unit uses electric power ordinarily available (i. e., 110 volts, 60 cycles).

The Keyboard Unit

The Linofilm keyboard unit, occupying the space of a typing desk, consists of a standard typewriter, a small auxiliary panel for a few selector and control keys, a justifying unit and a perforator.

The keys of the typewriter itself are slightly rearranged for ease of operation. The auxiliary selector and control panel has keys for hair spacing between characters in increments of twelfths of an em, font selector keys, a quad left key, an end of line and justify key, and a line erase key. These are compactly arranged for operator convenience.

The justifying unit is a mechanical justification computer and indicator, and the perforator is an electro-mechanical punching unit which perforates the appropriate code on paper tape. Tape is the medium which permanently stores and carries all keyboard information to the photographic unit. The tape is easily handled and can be held for re-runs as needed.

Keyboard settings are made by the operator according to the type size and length of line specified. In the pre-production model being exhibited line lengths up to 30 picas can be handled and the operator can letter-space and word-space. Justification of the line is computed mechanically and punched into the tape automatically.
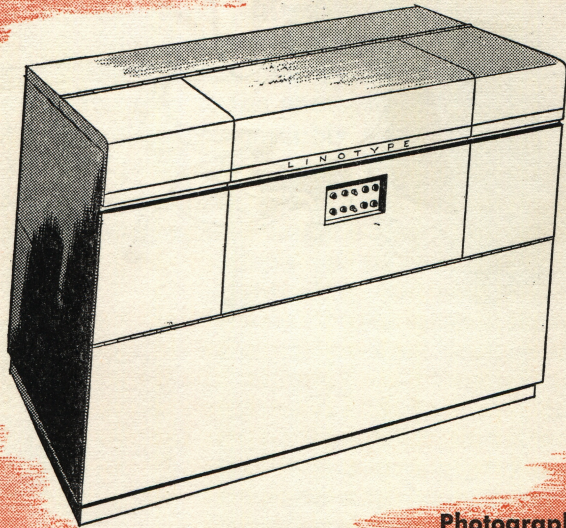
The operator punches into the tape the specifications for capitals and lower case of Roman, Italic and Bold Face, as
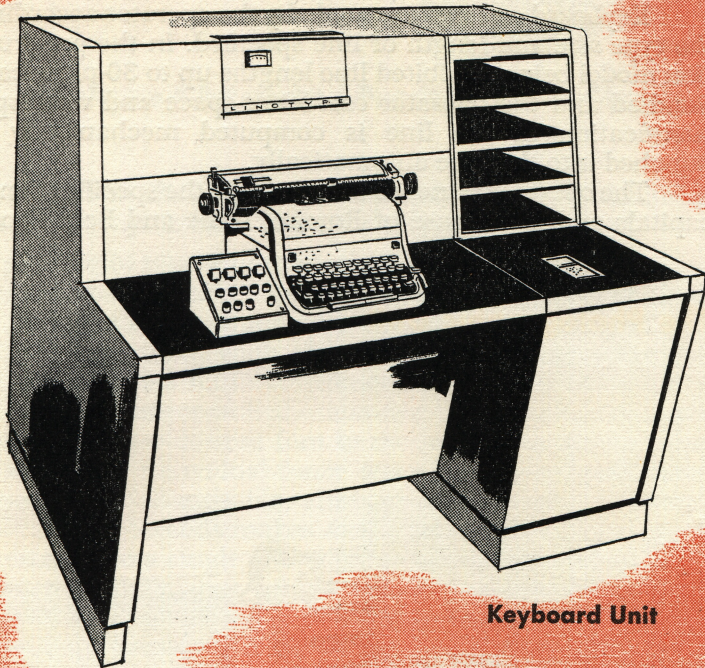
Keyboard Unit

Photographic Unit

well as small capitals and pi characters. The operator also sets blank spaces and blank lines.

Use of a standard typewriter keyboard means that there is no keyboard limitation on operator speed and output. Output of the entire typing unit is limited only by the speed of the operator.

The Photographic Unit

The photographic unit of the Linofilm contains a reader unit, an optical system and a film magazine. It occupies approximately the same floor space as the keyboard unit. All of the functions of the photographic unit specified by the tape are controlled electrically.

The reader unit is an electro-mechanical reader for decoding the information punched on the tape by the keyboard unit. Its construction is simple.

A multi-projection optical system is used to project any single character from an array of characters to a common photographic point. The optical system is unique and consists of a light source, the character arrays mounted on a vertical turntable and an optical turret assembly.

The film magazine is a holder containing the film and a mechanism for advancing it between lines. The film magazine is lightproof and removable in its entirety. In addition, through the use of a separable film cartridge exposed film may be removed from the main magazine at will.

The product of the pre-production model being exhibited is a wrong-reading positive (black letters on a clear base), but production models will be able to produce either wrong- or right-reading positives as desired.

The photographic unit of Linofilm contains a minimum of moving parts and mechanisms. In the pre-production model of the first of the Linofilm line it operates at approximately the speed of the Comet Linotype machine. However, because of its unique optical system, Linofilm's photographic unit has no inherent speed limitations. The speed of the photographic units in production models will be greater and will meet any requirements of the industry.
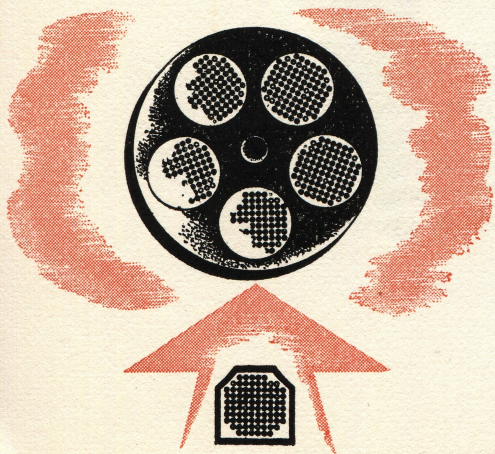
LINOFILM'S
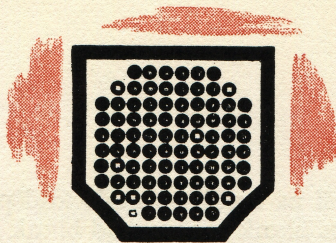
Unique Character Presentation Method

THE HEART of the Linofilm is the optical system contained in its photographic unit. The optical system consists of:

(a) A light source illuminating the character array.

(b) A vertical turntable which carries a number of small glass plates on which type characters are arrayed in a grid formation, each glass plate containing what corresponds to a font complement of type characters. The turntable is controlled automatically from the tape and presents the desired font to the optical system for photography. Individual fonts, as well as whole turntables, are easily changeable, although enlargement by photographic methods makes available a wide range of type sizes from a single character array. The turntable in the photographic unit of the pre-production model being exhibited now carries five glass plate character grids, but the turntable in the ultimate production model can be constructed to carry an additional number of such character grids.

(c) A shutter system permitting selection of any single character from the array (font) selected.

(d) A multi-projection lens system which projects the selected character to the photographic point.

(e) An optical turret assembly accomplishing optically the required point size changes by enlargement.

This optical system enables Linofilm to utilize a completely new character presentation method that places successive letters on stationary film from a static character array. Weightless beams of light replace costly, bulky and complicated devices requiring continuing maintenance and periodic replacement. From an operational viewpoint this also means that no time or energy is required to start and stop the parts replaced by inertialess beams of light.

Because of its unique optical system Linofilm has no inherent speed limitations and no variations in character placement or alignment.

Typographic Aspects of
LINOFILM

THERE IS no limiting factor in the Linofilm which will prevent the adaptation of any existing Linotype face or character to Linofilm use. Some modifications of Linotype faces will be necessary to convert to Linofilm's unit system, letter characters designed on random widths. In making those modifications full advantage will be taken of those benefits peculiar to a photographic system.

The basic family characteristics can and will be retained; so, while a Linotype and Linofilm face may not be identical letter by letter, the overall appearance of the two will be the same. For the demonstration of the pre-production model of the Linofilm, an experimental Roman, Italic and Bold Face type has been prepared. Work is proceeding on the conversion of the following Linotype faces for Linofilm use:

Baskerville	Garamond No. 3	Spartan
Bell Gothic	Granjon	Textype
Bodoni	Gothics	Times Roman
Caledonia	Janson	Corona
Caslon	Memphis	Excelsior
Electra	Metro	Ionic
Fairfield Medium	Primer	Paragon

A full library of Linotype faces will be available when the Linofilm is offered to the trade. For languages other than English a standard assignment of position for each required

accent will be adopted. Non-Roman languages will be given individual consideration and treatment.

Spacing within the line on the Linofilm is keyboard controlled. The necessary fixed spaces may be introduced between characters or words as required in a full and adequate range of sizes from hair space to full em.

Variable spacing for justification is between words only. The minimum provided by the machine is small enough to allow fine, close spacing. Spacing between lines, or leading, is controlled in the photographic unit in increments of points up to 24 points, but blank lines of the body size being set can be allowed.

Kerning, both to the right and to the left, is possible. Italic is full kerning. Any variety of pi characters is readily available. The pre-production model being demonstrated quads left, but full quadding can be made available on the production model.

The range of type sizes in the pre-production model of the Linofilm being demonstrated is from six to sixteen point. As in Linotype practice, it is recognized that a single letter design will not suffice for a full range of sizes from six to sixteen point. Consequently, two character grids are used in the Linofilm to cover the full size range of this machine. The smaller is six point (prepared from eight point designs), and by enlargement covers eight and nine point as well as six point. The larger is ten point (prepared from 12 point designs), and by enlargement covers 12, 14 and 16 point, as well as 10 point. In the production model additional sizes can be made available.

There are no variations in character placement or alignment in the Linofilm. The clarity of the type-on-film product of the Linofilm is excellent, and far above the requirements of any known reproductive process. There is no distortion inherent in the Linofilm optical system and the original type design is reproduced on film with great sharpness and fidelity.

CORRECTIONS
—The New Multi-Methods Approach

IN ITS PHOTO-TYPESETTING research and development Linotype has consistently recognized that one of the problems most likely to retard the use of photo-typesetting even in applications otherwise economical, revolves around the difficulty presented by corrections and make-up. Much thought and work have been devoted to corrections and make-up concurrently with the development of the Linofilm itself. This has resulted in a multi-method approach to corrections and the development of a new concept for handling make-up activities.

The several methods for correction now evolved are these:

(a) Typing errors detected at the keyboard can be corrected immediately through the use of the Line Erase key on the auxiliary panel.

(b) The typed copy made available with the tape can be edited and corrected, and the tape changed *before* photography.

(c) The film itself may be corrected by a new automatic splicing device which we have tentatively named the Photocorrector, a product of Linotype research.

(d) The film may be corrected piecemeal or in large segments by corrections in the perforated paper tape *after* photography, and the offending line, lines or full section re-run.

In actual practice these methods can be used singly or in combination. The availability of all of them at various stages in the photo-typesetting process will materially reduce the difficulties and complexities of making corrections. This, in turn, will affect the economics of photo-typesetting and the photo-composing process as a whole.

The Line Erase key on the auxiliary control panel enables the keyboard operator, upon detecting a typing error, to punch into the tape a signal which will cause the incorrect line to be disregarded by the photographic unit. Correction of the tape itself is a simple scissors and mucilage operation.

The inch of blank space on the tape at the end of each line affords ample space for an easy lap-splice which the photographic unit will accept without difficulty.

The new device developed by Linotype for correcting film is a single-unit, fully automatic heat splicer. As a single unit operation, it successively cuts the film, removes the offending line, inserts the new line, butts the separate pieces of film and welds them together accurately. No overlay is required because butt welding is used. The resulting corrected film photographs perfectly. The total elapsed time for the full operation is measured in seconds, and the skill required is the simple one of feeding the offending film into the corrector and removing the corrected film.

An experimental model of the correction device is in practical operation in our research laboratories and a mock-up of it is being shown to the trade at the exhibition of the Linofilm. Testing and product engineering are proceeding so that the correction device will be available with the Linofilm.

Linotype research has also developed a new concept for handling film for make-up purposes. Preliminary constructions indicate that this new approach will greatly facilitate film make-up. Research models of the devices are in preparation. They are surprisingly small and uncomplicated.
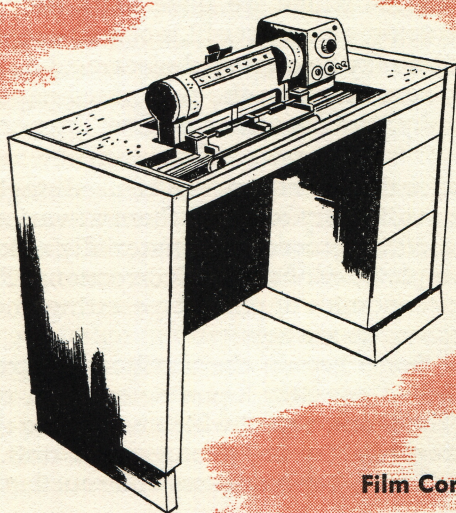
Film Correction Device

LINOTYPE'S PLAN

For the Linofilm Line

THE LINOFILM being demonstrated in operation to the trade during the week of April 19th is a pre-production model of the first of the new Linofilm line of photo-typesetting machines. Immediately following the week of exhibition, the machine will enter a period of intensive testing. During that time it will not be further exhibited.

Linotype's engineers have begun work on the production model. Despite the simplicity of the Linofilm in its present pre-production form, improvements have already suggested themselves during the development of this model. These, together with the changes indicated by the results of intensive testing, will be incorporated in the production model. Speed, range, simplicity and automaticity will all be improved before the Linofilm is offered to the trade in 1955. It will be produced in the volume indicated by demand.

Linotype research is in the process of developing the second machine in the Linofilm line. It is being designed for display and related commercial applications. A pre-production model will be demonstrated to the trade in 1955. It is anticipated that with this second machine the Linofilm line will be complete except for certain special photo-typesetting machines for highly unusual applications concerning which we have already been consulted.
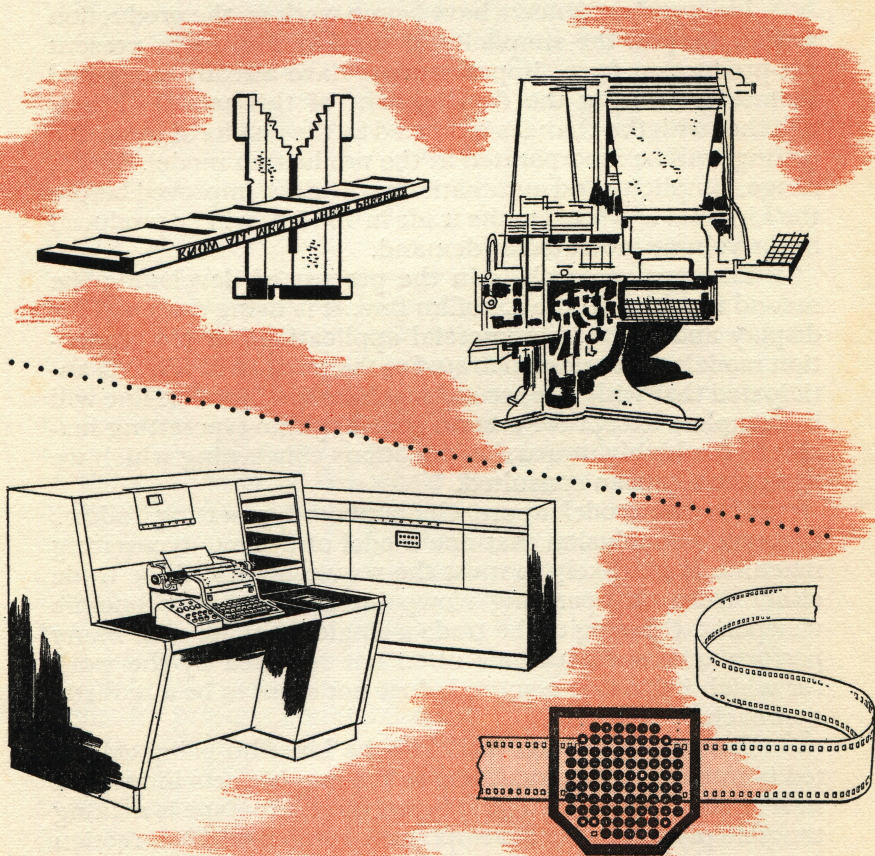
The two-model approach to photo-typesetting follows Linotype's conclusion that one model of a photo-typesetting machine is not likely to meet the requirements of the trade either from an operating viewpoint or from an economic viewpoint. Offering to the trade a single machine with many performance specifications often not required by the work for which it is being acquired, does not seem to be a realistic approach.

The pre-production model of the Linofilm being exhibited is intended to demonstrate to the graphic arts industry a new concept in photographic typesetting. Linotype is making tangible progress with developments in the field of correction

and make-up as well as with the second machine in the Lino-
film line. We are also making detailed studies of the econom-
ics of photo-typesetting and the photo-composing process to
assist the industry in its consideration of practical applica-
tions. Others are at work on collateral developments in plate-
making.

Within the next year or two all of these activities will
result in creating an understandable and readable pattern
enabling printers and publishers to make a more precise eval-
uation of photo-typesetting and its probable future in the in-
dustry. The Linofilm will then be able to assume its proper
place in the industry along with the Linotype.