# **Book of Proceedings**



Sara Velez Luís Frias Joana Casteleiro-Pitrez (Eds.) Hot Metal Typesetting with a Ludlow Typograph. Hand-set and linecasting with a semi-automatic system (Model M, 1966)

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#### **Abstract**

The Ludlow Typograph (LT) system, 1905-2003, is part of a new period in the graphic arts industry that occurred between the end of the 19th century and the beginning of the 20th century, marked by major technological developments that allowed the transition from manual printing to mechanical industry. This system resulted in a semi-automatic machine, with manual composition and mechanical casting, prepared for the casting of lines of text and specifically designed to work with larger type sizes in order to compose and cast titles.

Having as object of study the Ludlow Model M machine (SN: M18454), which belongs to a private collection in Oporto, the objective established for the article named "Hot metal typesetting with a Ludlow Typograph. Hand-set and linecasting with a semi-automatic system (Model M, 1966)" was to explain the steps that were necessary to be able to cast lines of text with the Ludlow Typograph system in this day and age.

First, the history of the Ludlow Typograph system is explored in general. Then, the entire universe concerning the object of study LT M (SN: M18454) is investigated, thereby presenting: the pathway of the machine to get to the place where it is today in operation; the process of listing the items belonging to the case study, the steps that allowed the equipment to be operated under conditions, including: the description of the cleaning and maintenance activities of the machine, the explanation of measurements, tests and operational attempts, and, finally, the report of the first successful casting attempt. Getting the equipment up and running was a slow and arduous process that was only possible through a process of trial and error, since the authors of this article never had operated a Ludlow Typograph machine before and the LT M (SN: M18454) was no longer working, at least since 2005.

#### Keywords

Ludlow Typograph, Linecasting, Hand-setting Composition, Typecasting.

## 1—Ludlow Typograph

The Ludlow Typograph is a semi-automatic machine, designed for linecasting, which produces large-scale lines of type with the characters raised (Dias & Meira, 2018: 96). According to McGrew (1996: xix), the Ludlow's type sizes were mostly from 6 to 48 point, but for certain types it was possible to go from 4 to 216 point. It was on newspaper and magazine production that the machine had the most influence, due to its proficiency in handling larger type.

According to Craig (1980: 24), the Ludlow system was introduced in 1906 by Washington Irving Ludlow (1835–1916) and improved by William A. Reade (1867–1930), a machinist with experience in printing machinery. In 1906, the Ludlow Typograph Company was born. Reade designed and built the machine in 1909 (Bringhurst, 2006: 388) and it began to be sold in 1911 (Marshall, 2005: 815). The LT was launched under several different models as it was gradually improved and refined.

By 1984 there were about 16000 Ludlow machines in operation worldwide (Williams, 1984: 20).

The Ludlow combines hand-setting with mechanical casting. An operator takes matrices from a matrix case and places them one by one into a composing stick with automatic justification, inserting blank matrices to justify the lines (Carter & Day & Meggs, 1993: 101). Subsequently, the lines of matrices are placed in the casting machine and coated with molten metal to create the line, and then the slug is cast which, once used, is cast again for reuse (Craig, 1980: 24).

In addition to being cheap and easy to operate, the Ludlow also contained a very high quality collection of fonts and was therefore the most viable option for industries that were unable to afford a Linotype (Carter, 1995: 119).

# 2—Case study: Ludlow Typograph, Model M (SN: M18454)

The LT M machine (SN: M18454)¹ was donated to Antero Ferreira, in late 2005, by Manuel Rodrigues Pereira da Silva (1930–2008), a typographer who was born in Póvoa de Varzim. The model was owned by Silvas — Cooperativa de Trabalhadores Gráficos CRL (Lisbon), which acquired it in late 1960. Following its donation, the equipment was shut down for fifteen years, and in September 2020 it went to Grafopel's² workshops for a major mechanical overhaul (general cleaning and lubrication, replacement of the water cooler hoses and the motor belt and the fitting of a suitable electrical plug) to make it operational for future use.

In May 2022, a list was made of what had been donated, which was crucial for understanding whether everything was there to operate the machine. From this inventory resulted a detailed list of each item: caster, water cooler, matrix case, composing sticks, tools, consumables, springs and screws, technical documentation and blanks material. Subsequently, the matrices and blanks material were organised and sorted, since they came mixed in a number of transparent bags (3576 brass) dies). It was crucial to understand the exclusive concepts of the brand, such as the functioning of the matrix identification gauge, which was produced in 3D with transparent acrylic, allowing the identification of the typeface families that would form part of this collection: Condensed Gothic, Record Gothic, Bodoni and Tempo. Finally, each of the matrices was arranged in the matrix case.

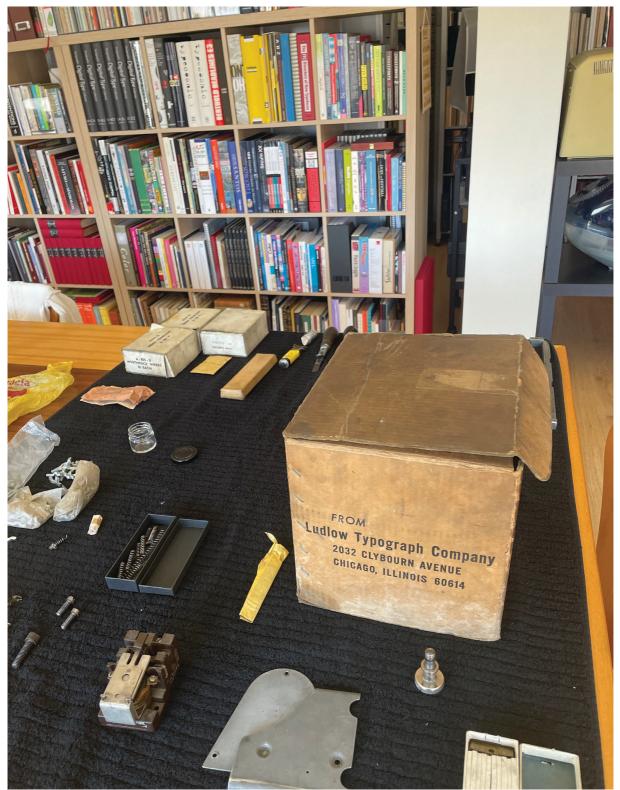
- 1. The model (M) was first introduced in 1966 (Romano & Mitrano, 2022, p. 314), so it was relatively new equipment for the printing market.
- 2. A Grafopel, Equipamentos Gráficos S.A., founded in 1964, has facilities in Perafita, Matosinhos. It is the Portuguese representative for the German manufacturer Heidelberg Druckmaschinen solutions for industrial print production, which was founded in 1859 and is a world leader in precision equipment for the printed media industry.



80–1 LT M (SN: M18454), 2022. { Photography: Antero Ferreira and Leonor Secca }



81–1 LT M (SN: M18454) in Grafopel, 2020. { Photography: Antero Ferreira and Leonor Secca }



82–1 Organization of all the material donated together with LT M (SN: M18454), 2022. { Photography: Antero Ferreira and Leonor Secca }



83–1 Identification and organization of the matrices in the matrix cabinet, 2022. { Photography: Antero Ferreira and Leonor Secca }

# 3-Cleaning and maintaining the equipment

Cleaning and maintenance were essential to successfully cast slugs with the equipment. From June 2022, the machine began to undergo regular cleaning and overhaul work. About once a week, it was necessary to oil all the lubrication holes, remove loose slag that would be scattered around the machinery, check that the hose connections and clamps were tight and confirm that the water levels were correct. This whole process takes about 30 minutes.

## 4—Measurements, testing and operational trials

In the first attempts to activate the equipment, successive setbacks arose<sup>3</sup>, due to: the authors' inexperience in casting; the Ludlow Typograph Company having been dissolved for around twenty years; a complete lack of information on the recommended oils, lubricants and their quantities for the equipment's maintenance; there being no active casters in Portugal using Ludlow equipment; and there being only minimal technical assistance in the USA. The only assistance was obtained through occasional contact with experts from distant countries, such as Germany, Canada and Norway. It should be noted that this model and its technology entered the market in 1966 and that the equipment (SN: M18454) has been off-line since 2005, i.e. inactive for almost twenty years.

The next phase involved checking each of the system components: caster, pot/crucible, dual indicating thermostat and water cooler, with numerous problems being detected.

### **Water Cooler**

¶ Lack of water in the internal well — Solution: L5 litres of distilled water were added with approximately 200 ml of LIV soluble cutting oil<sup>4</sup>; the external water level mark was right in the middle of the porthole;

<sup>3.</sup> It is a machine and a system that requires meticulous learning and careful and thorough maintenance. It is important to note that LTC filed over 100 patents, and had a protectionist policy advocating, internally, confidentiality over the commercial documentation it made available to its vendors and representatives.

<sup>4.</sup> The oil used was LIV Taladrina Blanca, Productos LIV S.L., Mutilva Baja, Navarra, Spain. In the product description it says: oil for metal mechanisms which, when mixed with water,

- Water leakage in the (internal) hose Solution: the hose connecting the compressor to the water pump was replaced;
- External outlet and inlet hose (to cool the mould) replaced — Solution: the connection was changed and the washers tightened;
- With the equipment disassembled (external panels) we took the opportunity to carry out a general clean.

**Dual thermostat** 

- ¶ Thermostat bulb burnt out (the thermostat has two bulbs, hence it is dual: thermostat + simmerstat) — Solution: replaced with LED bulbs of 110 volts each:
- ¶ Lack of temperature control in the crucible (main thermostat failure) Solution: replacement by a latest generation system: Shinko multi-range digital controller (model BCS2R00-00)<sup>5</sup>, which resolved the malfunction and brought with it some advantages, such as: temperature control in various modes (ON/OFF, PID or programmer); K-type (Ni-Cr Ni) temperature sensor, max. 400°C; and sensor break protection (shuts down the heating system). This has made it possible to control the temperature degree by degree and to have an electrical system with expansion possibilities, such as recording melting temperatures and controlling injection nozzle resistances via simmerstat.

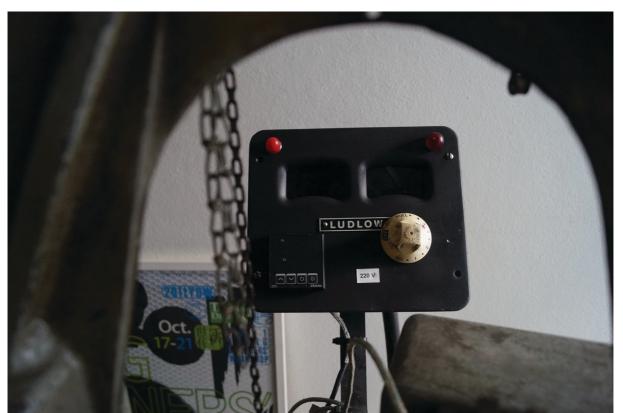
#### Pot/Crucible

¶ Temperature of the resistances out of control, reaching 460–480°C (thermostat failure and dead probe) — Solution: replacement with Shinko controller.

# **Plungers**

Oil and lubricant tested inadequate for cleaning and lubricating the plungers — Solution: After several approaches and failed attempts, the produces a highly stable, milky emulsion that is anticorrosive and provides optimum lubrication and cooling effects.

5. Digital device manufactured by Shinko Technos Co Ltd. (Osaka, Japan), represented in Portugal by António Moutinho, Instrumentos de Precisão Ld.a, Porto, Portugal; proposed, programmed and installed by specialist Ernesto Campos.



86–1
Dual thermostat after lamp replacement and digital controller installation, 2022. { Photography: Antero Ferreira and Leonor Secca }

solution was found by using Klüber Molybkombin UMF T4 Spray lubricant (self-lubricating dry film, flash point 450°C) and Chem-Trend PL-753 oil (Liquid Plunger Lubricant);

Plunger stuck in the Crucible — Solution: Production of a manual steel extractor.

Electric motor

Mechanical fault. Spanner (or fuse) to drive the starting shaft — Solution: replaced with a new one.

# 5—First casting: 4 lines of blanks and 2 lines of text

On 3 August 2022, a new test began. The process was as follows:

- Both plungers were cleaned, with the help of a steel brush (removing residues, traces of lead and burnt oil) and scraped externally with fine metal sandpaper<sup>6</sup>;
- 2. Using the plunger holder, the cleaning plunger was preheated in the crucible mouthpiece (10' to 15');
- 3. Once heated to 290°C, the crucible was cleaned using the plunger holder, making 180° rotations and alternating with gentle up and down movements;
- The cleaning plunger was removed and the injection plunger was lubricated externally with Klüber lubricant spray<sup>7</sup>;
- 5. A few drops of Chem-Trend 16 oil were added in the centre of the crucible mouthpiece;
- 6. The injection plunger was preheated in the crucible mouthpiece (10' to 15');
- Then, gently and without ever applying pressure, the plunger was inserted using gentle horizontal rotations until it descended and moved freely;
- 8. The plunger connecting lever was secured by attaching the two plunger connecting yoke pins, not forgetting to fasten them with the plunger

6. Robbialac sandpaper was used, references P400 and P2000.

7. The lubricants that worked were: Klüber Molybkombin UMF T4 Spray (self-lubricating dry film up to 450°C) and Chem-Trend PL-753 (Liquid Plunger Lubricant), generously provided by the specialised company Paulo C. Barbosa Ld.ª, Campo VLG, Portugal.



88–1 Cleaning piston in the nozzle, 2022. { Photography: Antero Ferreira and Leonor Secca }

connecting lever pin holder. With the crucible finally cleaned, everything was operational and ready for the casting test.

On 5 August, the caster and the water cooler were switched on: after about 60' the caster reached the temperature set for casting (290°C) and the water in the water cooler was 16°C inside, 20°C outside and flowing freely through the hose; the table top was assembled, the two lock down knobs were fastened: the mechanical system motor was switched on; the blank slug block was inserted<sup>8</sup> and the safety clamps were applied, including the central lever (top left of the table top); the casting lever was activated and after 9" the first slug (line) came out. Emboldened by this casting success, we added the phrase "Ludlow Padrão 050822" to the slug to celebrate the experiment, and the success was then repeated. After seventeen years of waiting and about six months of persistent observation and testing we achieved the main goal: casting slugs of type.

8. Initially, 3 to 6 blank slugs must be cast in order to clean and prepare the system for casting slugs of type.



Composing the commemorative phrase in the composer, 2022. { Photography: Antero Ferreira and Leonor Secca }



91–1 Word 'Ludlow' casted with LT M (SN: M18454), 2022. { Photography: Antero Ferreira and Leonor Secca }

### 6—Conclusion

This article presents and compiles a series of novelties that provide a very effective understanding of how a Ludlow Typograph machine works. We can list several achievements:

- 1. The LT mechanisms were understood and the text lines were cast with the LT M (SN: M18454);
- 2. A list was made of all the equipment coming from Silvas CRL (Lisbon) resulting in a total of 3709 pieces, including 3576 dies;
- 3. The dies were classified using the Ludlow Matrix Identification Gauge and the same was produced in 3D with transparent acrylic;
- 4. An extractor was designed and produced;
- 5. The formulas (compound and percentages) for oils and lubricants used in the water cooler and crucible cleaning/injection were identified, data that we could not find anywhere else;
- 6. The system performance was improved and modernised with the installation of a digital controller and the use of high-quality lubricants.

It was an arduous, yet very rewarding process, as the established objectives were successfully achieved and even surpassed.

It is also essential to point out that an extensive survey was carried out to find operational Ludlow Typograph machines in Portugal and there have been zero results, which allows us to say that this machine is the only Ludlow, to this day, still casting in the country. Furthermore, the last casting record found in Portugal was at Fundição Tipográfica Manuel Guedes, in Lisbon, which is said to have closed in the 1990s.

In August 2022, casting resumed privately in Porto using the Ludlow M (SN: M18454).

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#### Colophon

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