The Gender of the Machine

Printing Workers and Mechanical Typesetting (France, England, 1840–1880)

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Printing Workers and Mechanical Typesetting (France, England, 1840–1880)[1]

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Under the July Monarchy, the specter of mechanical typesetting threatened typography workers: "Not content with the harm done to this profession by *cliché* platemaking and polytyping," noted Jules Ladimir, "they are inventing even more detestable machines that will reproduce works with neither characters nor typesetters."[2] It was first printing that was transformed by the development of mechanical presses in the beginning of the 19th century, followed by the diffusion of rotary presses in the second half of the century. The upstream labor step, on the other hand, that of typesetting, would be mechanized much more slowly.

Assembling movable lead type was done manually by the typographer up to the diffusion of linotype usage in 1890–1900. How can the stability of this technical system and the maintenance of the traditional organization of typesetting labor be explained?

Before the advent of the linotype, historians of technology find nothing but "ingenious but impractical experimentation."[3] However, during the beginning of the 1840s, innovations to replace case workers multiplied. The "pianotype" of Young and Delcambre raised the first controversy.

The machine announced an upheaval in the structure of the printing labor market favoring the employment of workers judged to be illegitimate – notably women, who were paid much less – and disrupting the organization of workshops. Faced with such threats, printing workers such as minor master printers

1. A first version of this article was presented at the symposium "Genre et histoire" (Paris 1, led by Violaine Sébillote). Thanks to Philippe Minard, Pap N'Diaye, Alice Primi, and Vincent Robert for their careful reading and advice.

2. Jules Ladimir, "Le compositeur typographe," in *Les Français peints par eux-mêmes. Encyclopédie morale du XIXe siècle*, ed. Léon Curmer (Paris: La Découverte, 1840-1842/2004), 917.

3. Antoine Seyl, *La composition mécanique* (Brussels: Imprimerie scientifique et littéraire, 1926). Most histories of printing techniques adopt this teleological appraisal and examine the experiences of the 19th century as measured by the sole triumph of the linotype.

reacted by reasserting the trade identity, particularly its masculine dimension. The failure of "pianotype" thus resulted after negotiations.

By situating ourselves before the introduction of the linotype, during the period of experimentation and doubt, we will attempt to pinpoint the technical change in the size of the social universe that prevailed at its inception.[4] The typesetting machine, created in England and rapidly introduced in France, gave rise to complex discursive constructions: each attempts to impose a definition on the technical artifact. Faced with innovators praising the benefits of the new method, typesetting workers, who constituted in the two countries a skilled worker élite, would denounce the technical and moral impasses of the machine. They implemented resistance strategies often closely faced with transformations that would emerge in the workshop and impose, in the end, a negotiated mechanization.

Mechanization of Typesetting: Experiments

After 1830, the "typographical Ancien Régime" slowly became outdated.[5] Mechanical presses greatly increased print productivity. The steam-powered cylindrical press by Koenig, used for the first time in 1814, for printing the *Times*, was introduced in France in the final years of the Restoration, and its use then spread progressively.[6] Quickly, typesetting mechanization experiments also emerged.

Platemaking, Stereotyping, and Mechanical Typesetting: Responses to Market Pressures

Growth in press productivity and the development of printed periodicals pushed research on new, faster typesetting methods in order to get around the bottleneck.[7] Indeed, manual typesetting could no longer keep up with the possibilities of press runs and required excessive labor to avoid breaking the

4. Wiebe E. Bijker et al, eds., *The Social Construction of Technological Systems: New Directions in the Sociology and History of Technology* (Cambridge, MA: MIT Press, 1989); Bruno Latour, *Aramis, Or, the Love of Technology,* trans. Catherine Porter (Cambridge, Mass: Harvard University Press, 1996).

5. Roger Chartier, "L'Ancien Régime typographique," *Annales ESC* 36:2 (1981), 191-210. Despite the mutations of the revolutionary period, the technical organization of labor did not undergo major transformations: Philippe Minard, "Travail et travailleurs dans les imprimeries sous la Révolution: permanences et mutations," in *Livre et Révolution, Mélanges de la Bibliothèque de la Sorbonne* 9, ed. Frédéric Barbier et al (Paris: Aux Amateurs de Livres, 1989), 47-62; and "Agitation in the Work Force" in Robert Darnton and Daniel Roche (eds.), *Revolution in Print: The Press in France, 1775-1800.* Berkeley: University of California Press, 1989, 107-123.

6. Eric Le Ray, "La mécanisation des industries graphiques à l'aube de l'ère industrielle," in *Les trois révolutions du Livre,* ed. Alan Mercier (Paris:Imprimerie nationale édition, 2002), 301-311.

7. Frédéric Barbier, "Une production multipliée," in *Histoire de l'édition française*, ed. Roger Chartier and Henri-Jean Martin (Paris: Fayard, 1990), vol. 3, 109; Christophe. *Le siècle de la presse (1830-1939*) (Paris: Seuil, 2004); see excerpts from the principal English periodicals of the 19th century in Richard Daniel Atlick, *The English Common Reader. a Social History of the Mass Reading Public 1800-1900* (Chicago: Chicago University Press, 1957), 391-396.

rhythm of production. The only alternative was technical innovation.[8] They sought first to perfect cliché platemaking and stereotyping techniques, which let them preserve the pages of a book from a standard use, in order to proceed with later runs without having to reset it every time. The *cliché* was a metal plate from which one could run a large number of examples of the typographical composition; the stereotype means the result, the proof printed with cliché plates. It was discovered that, to accelerate the reproductions, it sufficed to use the print from a typographical composition made with traditional movable type, covering it with a lead alloy that, once cooled and solidified, provided a solid plate that could be kept for new runs. The improvement of the process is attributed to Louis-Etienne Herhan, who presented it to the Institut on 28 Thermidor, Year VIII (1800).[9] Though it had little practical success at the time, this invention is important to the extent that it challenged the principle of the mobility of type and, through such, announced the upheaval introduced at the end of the 19th century by the invention of monotypes and linotypes. Continual improvements were made to these processes.[10]

However, throughout the 19th century, efforts prioritized the automation of the setting of new texts: they attempted to mechanically set typographical characters stocked in a slightly elevated magazine through the intermediary of a keyboard. At the touch of a button, they were assembled in the desired order, in lines, and once the lines were finished, in pages. The first test of mechanical typesetting was carried out on the types themselves by an American, William Church of Boston, whose machine was patented in England in 1822. But the machine was never built. The 1830s and 1840s saw a perceptible growth in experimentation in this domain: Lyons-born printer and philosopher Pierre-Simon Ballanche, for example, outfitted a keyboard similar to a piano in 1833 with a special model of case. Several years later, a professor of mathematics named Gaubert developed, on a similar model, the "Gérotype."[11] But these various technologies remained at the level of experimentation.

8. Several works propose a typology of the machines invented for typesetting: John S. Thompson, *History of Composing Machines* (New York: Garland Publishing, 1905/1980); Richard Huss, *The development of Printers' Mechanical Typesetting Methods (1822-1925*) (Charlottesville, VA: University Press of Virginia, 1973); Seyl, *La composition mécanique*; Maurice Gouilloud, *Essai historique sur les machines à composer (1815-1910*) (Paris: Imprimerie des cours professionnels, 1910).

9. Armand-Gaston Camus, *Histoires et procédés du polytypage et du stéréotypage* (Paris: Renouard, 1802); Maurice Audin, "Histoire de la stéréotypie," in Maurice Daumas, *Histoire générale des techniques*, (Paris: PUF, 1968/1996), vol. 3, 750–755.

10. Pierre Arnaud-Leroux, *Nouveau procédé typographique qui réunit les avantages de l'imprimerie mobile et du stéréotypage.* (Paris: Imp. Didot, 1822); it was in fact Pierre Leroux, Herhan's nephew, who unsuccessfully attempted to improve stereotyping methods. See also the work of one Durouchail: *La stéréotypie perfectionnée et de son véritable inventeur* (Paris: Imprimerie Paul Dupont, 1834).

11. Alphonse Alkan made a detailed description of it in 1840: "Machine propre à la composition et à la décomposition des caractères d'imprimerie," *Annales de la typographie française et étrangère* 30 (December 1840), 82-87. See also the description, obviously in praise, that the inventor made: M. Gaubert (de Gers), *Rénovation de l'Imprimerie. Nouvelle puissance de la Mécanique. Notice sur le Gérotype ou machine à distribuer et à composer en typograhie, Rapport à l'académie des sciences le 5 décembre 1842* (Paris: By the inventor, rue Servandoni, 16, 1843), 15.

The "pianotype" invented by Young and Delcambre was the first typesetting machine truly tested in workshops. It drew from the principle which would be used by the majority of inventors up to the end of the century: that of a "type piano," in which the letters, stored in tubes, would be released by the touch of a button on a keyboard similar to that of a piano.

Origin and Diffusion of Mechanical Typesetting in England

The "pianotype" of Young and Delcambre was first conceived of and tested in England. On the face of things, the two inventors were ill equipped to succeed in their entreprise; the one was the manager of Young and Co. cotton and linen mills in England, and the second, Adrien Delcambre, was an industrialist in Lille. Neither of the two was a printer.[12] To develop the machine, they called on a machinist famous for his steel production process: Henry Bessemer.

After 15 months of development, the "mechanical typesetter" was finally ready, and the two industrialists secured a patent of invention in London in March 1840.

The press rendered an account of this discovery with interest, noting for example that henceforth "the operation of 'composing' is thus rendered a very simple affair."[13] The operation of this machine indeed appears to be simple: it groups the types – that is, the printing characters – classed by letters in the magazines and, at the touch of a keypad, lets them fall in the desired order to be assembled in lines. However, as the types still had to be put back in place after use, "distribution machines" were invented, which became the object of constant modifications with the view to replace the types in their cases (figures 1 and 2).

Several English printers quickly bought up this new process, which was on permanent display at the offices of Young and Delcambre.[14] This machine was used for typesetting such periodicals as *The family herald* or *The London phalanx*, as well as for other works.[15] But its use was not widespread – its excessive cost and difficult handling was quickly denounced. Many times, it

12. Henry Bessemer, *An Autobiography* (London: 1905), quoted in Brigitte Robak, *Vom Pianotyp zur Zeilensetzmaschine. Setzmaschinenentwicklung und Geschlechterverhältnis 1840–1900* (Marburg: Jonas Verlag, 1996), 24.

13. "From this brief description of the apparatus, it will readily be perceived that the operation of 'composing' is thus rendered a very simple affair" (*Mechanics' Magazine* 33 (1840), 317); see also Seyl, *La composition mécanique*, 24.

14. "Young and Delcambre's type-composing machine," *Mechanics' Magazine* 36 (June 25, 1842), 497-500. At the start of the 1840s, several publications gave an account of this innovation: *The Year Book of Facts in Science and Art, Exhibiting the Most Important Discoveries and Improvements of the Past Year* (London: Tilt and Bogue, 1843); *The artizan* 2 (February 28, 1843). The builder of these machines was J.-G.Wilson, at Clerkenwell, north of London (Seyl, *La composition mécanique*, 24).

15. The first issue of the *Family herald* (December 17, 1842) notes thus that "the paper which you have before your eyes may, justly, be considered a curiosity. It is the first publication that was ever made with entirely mechanical typesetting. This was executed by the typesetting machine of Young who, with untiring patience, after considerable work and expenses adding up to several thousand pounds sterling, revolutionized printing in resolving the problem of mechanical typesetting." It also was used for typesetting works such as that of doctor Edward Binns, *The Anatomy of Sleep*, in 1842 (Michael Twyman, *Printing, 1770–1970: An Illustrated History of its Development and Uses in England* (London: Oak Knoll Press, 1998), 60).

was adopted and then abandoned, without knowing the true reasons for the failure. In 1846, the two industrialists, having ended their collaboration, finally abandoned their London trials. Nonetheless, Young continued to work there and, in the following decades, presented newly improved models.[16]

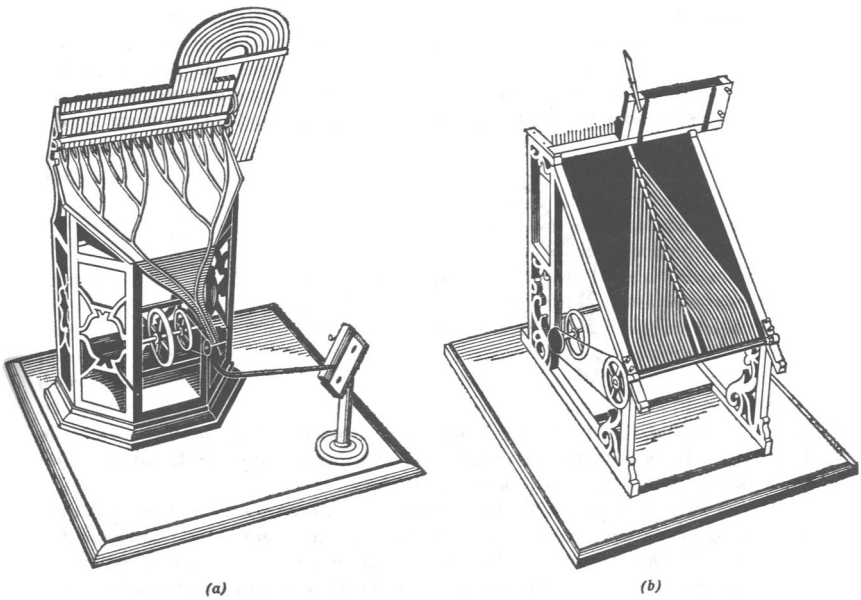

Figure 1 – The Pianotype Compositor (a) and the Delcambre Distribution Machine (b).
M. Daumas (ed.), Histoire générale des techniques, Vol. 3 (Paris: PUF, 1968), 775.

In the second half of the century, other typesetting machines working on the pianotype model emerged and spread on a larger scale. In 1842, the Rosenberg typesetting machine improved certain aspects of typesetting work.[17] Most importantly, Robert Hattersley, an engineer from Manchester, elaborated a mechanical typesetting process on the same model in the end of the 1850s, performed demonstrations in Manchester in 1859, and the *Manchester guardian* carried out several tests of this machine. Two models were sold in the *Eastern morning news* in Hull in 1866 and then in the *Bradford times office* in 1868.[18] In 1869, the apparatus was in use in the offices of the *Hertfordshire* and the *Bedfordshire express* in Hitchin. Other small newspapers acquired this machine in the following decades.[19]

16. Brigitte Robak, *Vom Pianotyp zur Zeilensetzmaschine*, 28.

17. "Rosenberg's type composing and distributing machines," *Mechanics'Magazine* 37 (October 29,1842), 401–405.

18. Alfred Edward Musson, "Newspaper printing in the industrial Rrevolution," *The Economic History Review* 10 (1958): 411-442.

19. In particular: *The Southpost Daily News* (1876), *Bradford Observer* (1881), *Liverpool Courier* (1883), *Sheffield Independent* (1885), *Liverpool Daily Post* (1886), *Newcastle Journal* (1889), *Preston Guardian* (1890), and the *Manchester Courier* (1891); see A.E. Musson, *The Typographical Association:*

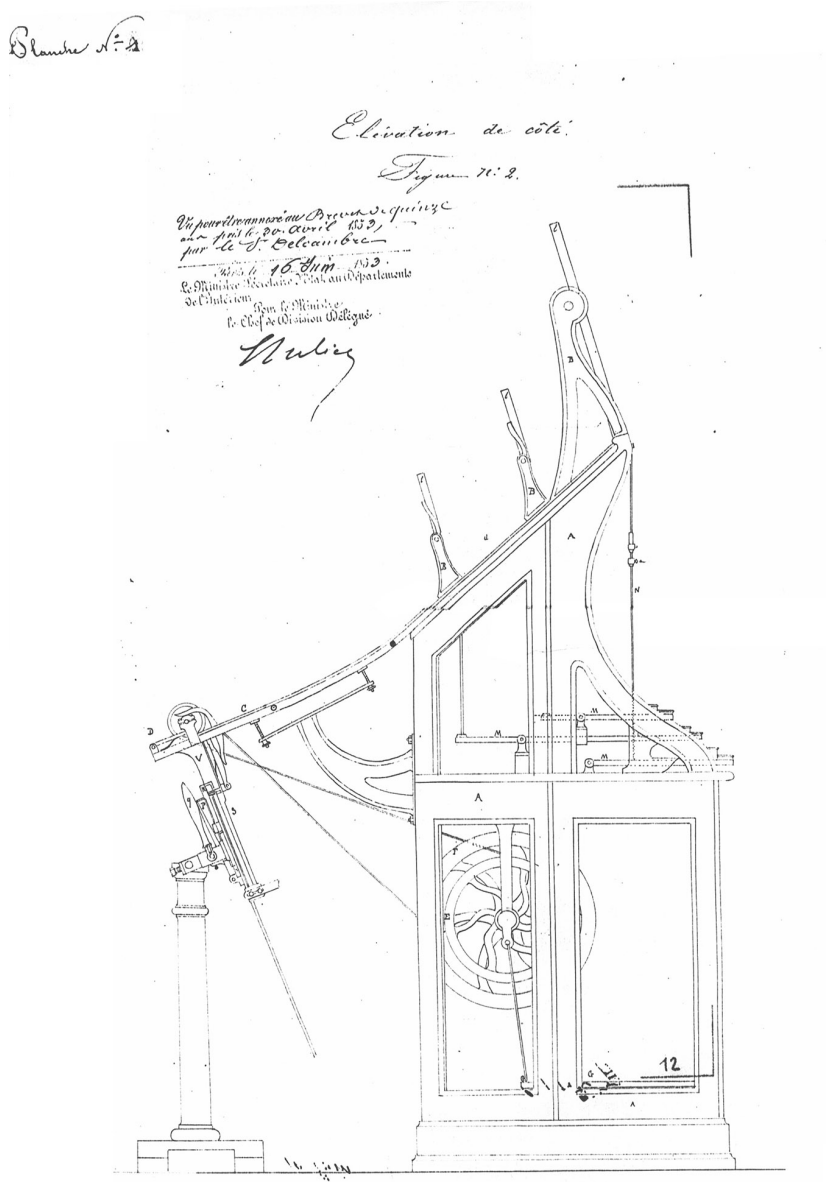

Figure 2 – The Young and Delcambre Pianotype Compositor
Patent, INPI patent of invention for 15 years by Delcambre on May 23, 1846, no. 3633

Origins and History up to 1949 (Oxford: Oxford University Press, 1954), 100 and 221-223; and Ellic Howe and Harold Waite, *The London Society of Compositors (Re-Established 1848). A Centenary History* (London: Cassell, 1948): 228.

For Auguste Jeunesse, who sought to promote the diffusion of these processes in French printing houses, there was no doubt that "the typesetting machines are widely employed in England."[20]

The first attempts at the mechanization of typesetting took place in London, but it was primarily in small-town printing houses that the mechanical processes were diffused. At the international exposition in London in 1872, the German Kastenbein machine was presented to the public and, from that date, was installed at the *Times*. In 1877, several other typesetting machines were presented in London at the "Caxtonian" exposition, in honor of W. Caxton, who had introduced printing to England.[21] The new processes expanded rapidly over the continent.[22] In the middle of the 1840s, Delcambre moved to Paris to introduce his typesetting machine.

The Course of Innovation in France

In Paris, Young secured a patent of importation on October 7, 1840; after the 1844 reform of patent legislation, other patents were secured by Young and Delcambre.[23] Their machine was presented at the industrial exposition of 1844 and Delcambre opened a workshop to get it working.

The experimentation and public operation of the machine served a publicity purpose: the industrialist invited printers from the capital to come see it work. Delcambre founded a print shop in the Montmartre quarter, in association with Young. It operated from 1844 to 1847, when it closed after financial losses estimated at 60,000 Francs.[24] In 1851, he entered into association with Jean-Baptiste Petit, manager of the *Moniteur du soir*, to create a limited partnership (*société en commandite*), called the "Néo-typographie," dedicated to the construction and diffusion of typesetting machines. In the statement that precedes the company statutes, the associates lay out the objective of the enterprise:

20. Auguste Jeunesse (secretary of the editorial board of *Annales du Génie civil*), "L'imprimerie et les livres," in Eugène Lacroix, ed., *Études sur l'exposition de 1867. Annales et archives de l'industrie au XIX^e siècle*, 8th series, vols. 36-41 (Paris: Eugène Lacroix editor,1869), 150-158: "La composition," 155.

21. See the account given of this exposition "Des machines à composer et des machines à distribuer I," *Typologie-Tucker* 71 (1878) and 75 (1878).

22. First in Belgium, the machine was displayed in the workshops of the newspaper *Le Phénix* at Gand and in July 1842, *Le Courier Belge* used it to typeset one of its issues: "Machine à composer les pages d'imprimerie; par M. Young et Delcambre," in *Bulletin de la société d'encouragement pour l'industrie nationale* (1842), 345–346.

23. Archives of the Institut National de la Propriété Industrielle, Paris (henceforth: INPI): Patent of importation for 15 years, delivered October 7, 1840, to Young (Arthur), represented in Paris by Lawson, rue Saint Honoré, no. 335; Patent of invention for 15 years secured October 10, 1844, by Young (no. 86); patent of invention for 15 years secured][by Belcambre on May 23, 1846 (no. 3633); patent for 15 years secured on November 20, 1849 by Delcambre (no. 9140).

24. Archives nationales, Paris (henceforth: AN) F18 1754, Delcambre file. Paris, August 6, 1853, report by the director of public safety to the minister of the interior on the printer patent requested by Delcambre.

The invention of printing machines [will create] a celerity previously unheard of, but the result will still be attenuated by the slow speed required of manual typesetting. To surmount this last difficulty was a problem that Mr. Delcambre was not afraid to face and, after 10 years of repeated trials, he has resolved it in the most complete manner; since, not only can a worker, using the typographical machine he invented, almost without training typeset just as surely as the most experienced typesetter, but, he can, according to his level of aptitude, do it five to eight times faster than by the ordinary process. . . Mr. Delcambre's discovery, which will allow us to reach the final limits of speed and inexpensive printing, was the indispensable complement to an art in which everything, from the paper which receives the print to the impression it makes, has already been mechanized.[25]

In 1853, once he obtained a new printing patent, he built some twenty typesetting machines.[26] He then further realized a series of important investments for his print shop.[27] In 1855, the Adrien Delcambre company was dissolved. In the following years, though, Isidore Delcambre, son of Adrien Delcambre, pursued the work of his father: he in turn filed a patent for a typesetting machine and opened a workshop to get it working.[28] On January 3, 1843, the editor of the *Courrier du Nord* announced that he used it. At the 1844 exposition, several models were sold. At the time, the large print shop of Paul Dupont used it in Paris.[29] In the middle of the 1850s, the pianotype was used to typeset periodicals, like the *Journal des consommateurs* and the *Voleur*,[30] as well as works and brochures that carried the note "printed by the mechanical process of Adrien Delcambre" and which sometimes reproduced the image of the machine (figure 3).

25. AN, MC Et / LXVIII/1008, Statutes of the limited partnership "néo-typographie," 01/30/1851 et 02/15/1851.

26. AN, F18 1754, Delcambre file (Paris, August 6, 1853), report of the public safety director to the minister of the interior on the printer patent requested by Delcambre. The author of the report stipulates that "at the moment, [he] is making some twenty of these new machines."

27. In the last year of 1853, Delcambre bought from various Parisian manufacturers 1,075 kg of characters, two iron typographical presses, one pneumatic press, one two-cylinder mechanism, and two mechanical presses; see AN, F18 2329: Déclaration des marchands et fabricants d'ustensiles d'imprimerie (1853).

28. Archives départementales (henceforth: AD) Paris, D 32 U 3 34: Registration of partnership deed of August 7, 1854 to August 17, 1855, deeds no. 329 and 330 (February 8, 1855); *Annuaire général du commerce et de l'industrie* (Paris: Firmin-Didot frère, 1858).

29. In this important print shop that employed 150 workers, 6 mechanical presses next to twenty manual presses, "two typographical compositor-machines" were also found, according to E. M. Pretot, *Annuaire de la typographie parisienne* 1 (Paris: Imprimerie Pretot, 1844).

30. "Six machines for typesetting, as well as six others for distribution, are installed in the print shop of one company for mechanical typesetting, on rue Breda in Paris, and, as it seems, these machines are employed for typesetting the *Journal des Consommateurs*, the *Voleur*, and other different works": *Rapport du Jury mixte international, Exposition universelle de Paris en 1855*. Paris: Imprimerie Impériale, 1956. 340.

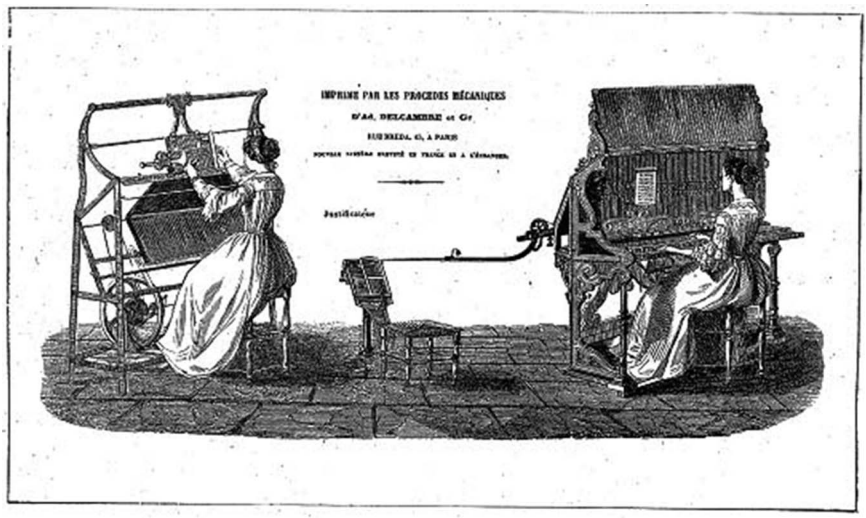

Figure 3 – Women Operating the Pianotype
Paris chez soi, revue historique, monumentale (Paris: Imp. Delcambre, 1855).

At the industrial exposition of 1844, Delcambre received a silver medal.[31] Conscious of the practical difficulties his mechanism still posed, he increased improvements in the following years. In 1849, he added a small mechanical press for proof printing, as well as a new machine to facilitate the distribution of type. It was presented again at the world exposition in Paris in 1855 and this time earned a second-place medal.[32] Reports from industrial jurys repeated their encouragement. At the world exposition in Paris in 1867, where it earned another award, "the typesetting machine of Messrs. Delcambre, Cruys and Co." was described by delegates of French typography as "the crucial point of this part of the exposition related to Typesetting labor."[33]

Other experiments were attempted in Paris in the second half of the century.

Danish typesetter Soerenson developed a machine that operated for some time in Paris and that earned the grand medal of honor for typography at the world exposition of 1855.[34] It was also in Paris that Charles Kastenbein developed his invention between 1866 and 1870, before moving to Brussels and then London. He presented his typesetting mechanism at the international exposition of 1872. In 1875, it operated in New York, in several London print

31. Report from the central jury, *Expositions des produits de l'industrie française en 1844* (Paris: Imprimerie de Fain et Thunot, 1844), vol. 3, 387.

32. *Rapport du jury central sur les produits de l'agriculture et de l'industrie exposés en 1849* (Paris: Imprimerie nationale, 1850) vol. 2, 168; *Rapport du Jury, 1855*, 340.

33. *Exposition universelle de 1867. Rapports des délégations ouvrières* (Paris: A.Morel, 1869), vol. 3: rapport de la délégation des typographes, 7.

34. *Rapports du jury mixte international publiés sous la dir de S.A.I. le Prince Napoléon, président de la commission impériale* (Paris: Imprimerie impériale, 1856). 334.

shops such as that of the *Times*, and in Belgium in print shops in Brussels and Braine-le-Comte (Hainaut).[35] In France, the Havas agency acquired five of these machines in March 1877.[36] Despite the initial enthusiasm they garnered, these processes were not installed in the print shops of the capital: "up to this point, the typesetting machine had been seen as a utopia. Then it began to enter into practice," reads the 1866 *L'Imprimerie*.[37]

Starting in 1840 and up to the 1880s, the mechanical typesetting model employing a keyboard operated in a certain number of French and English workshops, but without ever really disrupting typesetting work. In England, some small-town newspapers adopted mechanical typesetting in the 1860s, while in France, there were few examples of experimentation outside of Paris. In the 19th century, typesetting remained a manual activity controlled by workers proud of their skill and position. It was only in the last decades of the century that the mechanization of typesetting would spread with the development of linotype by Ottmar Mergenthaler. The originality of this machine, first installed in workshops of the *New York Tribune* in 1886 before arriving in Europe in 1887, was to smelt new type for each job, and thus to eliminate the fastidious task of subsequently distributing type. Linotype thus accomplished what mechanical typesetting never did.

Dream Mechanism

Mechanization is not only a technical process: before to be use, new machines must be rewritten into the culture of the trade. The first machines raise lively debates that crystallize principally around the question of their efficiency, problems of sexuated identity in the trade, and their impact on conditions for workers.

These discourses fashions a conflictual imaginary of the new technique that shapes its social reception.

The Question of Efficiency: Pianotype, "a Quasi-Intelligent Machine"?

In 1843, in an article titled "*Des claviers typographiques*" (Typographical keyboards), the recently created newspaper *L'Illustration* described the new processes in mechanical typesetting. The author of the article, amazed, noted that the process of Young and Delcambre "is remarkable for its proper execution, which allows it to be immediately put into workshops, without much dread of disruption and loss of time, as so often happens with new machines."

35. "Nouvelle machine à composer et à distribuer," *L'Imprimerie* 124 (1875), 617-620 and no. 125 (1875), 633-635.

36. "Des machines à composer et des machines à distribuer I," *La typologie-tucker* 71 (1878). See also the testimony of a former typographist: Edmond Morin, "Machines à composer," *Dictionnaire typographique* (Lyon: Imp. L. Sezanne, 1903).

37. *L'imprimerie* 29 (1866), 325.

Mentioning the diffusion of these new typesetting processes, the paper adds: "Today, typographical keyboards regularly operate in France and abroad." The same year, the editor of the *Courrier du Nord* wondered at "this new species of piano": "My words form, my sentences stretch out before my eyes, they match up on their own and, without any more knowledge of typographical arts than you may have, thanks to this quasi-intelligent machine, I am a typesetter." During this whole time, mechanical typesetting had its partisans, convinced that the machines announced a complete upheaval in the art of typesetting. To respond to critics that arose in the profession, Auguste Jeunesse asked in 1867 if "the members of three juries would have been in agreement six years apart to give awards to machines which are nothing but more or less clever toys, but which have no practical use?"[38]

Very early, judgements on this machine oscillated between admiration and complete rejection. The judgements firstly formed around the question of the productive efficiency of the new method. The machines did not disrupt the nature of typesetting work, separated types remaining at the basis of the operation. It was a question of mechanizing the work by replacing the craftsman's movements with automated methods for setting the characters.

They emphasized several technical problems: because of the laws of gravity, the characters dropped at different rhythms in the channels and thus risked getting mixed up, and in addition the operation tended to accelerate wear and tear on the characters. Furthermore, pianotype required at least three persons to work: the "compositor" who worked the machine, a person for manual justification, and another for distribution. The process thus did not eliminate labor, though it allowed the substitution of a cheaper workforce in place of experienced compositors who had undergone long apprenticeships. In the beginning, the cost of the machines was high, especially when compared to the deals on cases and types, which could easily be bought secondhand. Their price, however, did not stop falling: in 1867, Delcambre-Cruy sold the typesetting machine for 1,500 Fr and the distribution machine for 600 Fr.[39] Another subject for debate concerned the productivity of the machines, calculated by the number of characters raised per hour. A very agile worker could move up to two thousand letters an hour; thanks to typesetting machines, one could reach the fantastical number of 10,000 letters. The evaluation of the speed of typesetting machines raised lively debates and highly contradictory judgements. At their presentation at the exposition of 1844, the inventors of pianotype claimed their machines allowed the movement of 13,000 letters per hour. These extravagant evaluations accentuated workers' fears of being replaced by machines.

38. *L'Illustration* 4 (1843), 59-61; *Le Courrier du Nord*; Auguste Jeunesse, "L'imprimerie et les livres," in *Études sur l'exposition de 1867*, ed. E. Lacroix (Paris: Eugène Lacroix, 1868), 158.

39. Lacroix, *Études sur l'exposition de 1867*, 155.

Unlike mechanical presses that were introduced in several years, typesetting machines raised permanent debates and often contradictory evaluations. The cost difference with manual labor remained sufficiently weak to let typesetting workers create pressure on their bosses. For Charles Laboulaye, unlike mechanical presses, "which brought a savings of more than 50%," it did not appear that typesetting machines "could ever produce a savings of more than 25-30%, and following all probability, typesetting by hand could compete with that done by machine." In these conditions, "while their introduction, probably soon, could bring some savings to the cost price, it is not so much that it should bring a quick or profound perturbation in the typographical industry."[40] For the majority of observers, the profitability of typesetting was thus closely associated with the employment of a cheap labor force such a women and children.

This was one of the conclusions to emerge from the discussions at the presentation of the pianotype at industry expositions. Members of the 1844 jury, while praising the merits of the invention, recognized that its profitability depended on the employment of new workers:

> As by this process part of the labor is less troublesome than composing by the ordinary method, it can be executed by women, and thus reduce the price by half; this is what Messrs. Delcambre and Young have done. In the print shop of Mr. Levi, where one of their machines operates, it is women who perform all the operations, resulting in a considerable reduction.[41]

The members of the jury estimated that using the Delcambre machine operated by women would allow a savings of about 25% of costs.[42]

In England, the industrialists also used a female labor force.[43] In London, the Young and Delcambre machine was first operated by men for several months. But faced with the low profitability of the work, the inventors decided quickly to employ women. They circulated an announcement to recruit female typesetters, in which we find a first redefinition of sexuated identities at work.[44] Over the course of the 1860s and 1870s, the Hattersley process raised the same reservations. To be profitable, it required employing a workforce that had not yet completed the legal period of apprenticeship.[45]

40. "Systèmes de composition par procédés mécaniques," *Le Bulletin typographique* 5 (1843).

41. Report of the central jury on the machine of Messrs. Delcambre and Young, in *Expositions des produits de l'industrie française en 1844* (Paris: Imprimerie de Fain et Thunot, 1844), vol. 3, 282-287.

42. The price for typesetting 35,000 letters by the ordinary method is estimated at 17.50 Fr.; "By the method of the machine of Messrs. Delcambre and Young," notes the report, "and by replacing women and children for the labor of typesetter workers, one would obtain a savings of 4 to 5 Fr. on this price of 17.50 Fr." *Expositions des produits de l'industrie française en 1844*.

43. "In the case of the machine exhibited it is a young lady who officiates." *Mechanics' Magazine* 36 (1842), 497.

44. This announcement reproduced by the *Compositors' chronicle* stated: "To young Women requiring Genteel Employment – Wanted several Young Women, who can read well and spell correctly, to be occupied from Nine in the morning until Eight in the evening. The occupation is genteel, light, and sedentary…" quoted in Robak, *Vom Pianotyp zur Zeilensetzmaschine*, 25.

45. It was impossible to use this machine profitably if the employment of women was forbidden, according to Ellic Howe, *The London Society of Compositors*, 229.

Founded on the ideology of separate spheres, which made female labor simply an extra help to male labor,[46] the inequality of pay constituted a strong incentive for the adoption of the new processes.[47] The question of employing women also was at the center of numerous descriptions of mechanical typesetting. Most of the newspapers of the July Monarchy offered their readers, sometimes as a serial, long descriptions of the new processes presented at the Palais de l'Industrie in 1844. In *La Réforme*, for example, Etienne Arago explains directly that "the advantage that this invention [the pianotype] could offer today is to allow the replacement of men by women and children."[48]

"Sexuation of the Technical Artifact"[49]

The diffusion of typesetting machines thus entailed the employment of women to work them. This economic constraint rapidly oriented the social representations of the new processes. One can so determine how masculinity and femininity functioned symbolically around the artifacts and fashioned the trajectory for technical change.[50] If gender first designates a cultural construct removed from the biological,[51] then inanimate beings could equally be seen from the angle of an assigned sexuated identity. The example of mechanical typesetting provides a good illustration of this process, since early on, it crystallized a series of symbolic markers that closely identified it with the feminine sphere, and thereby rendered it suspect in the context of a world of essentially masculine trades. Indeed, unlike the work of a case typesetter, working on the new mechanism entailed skills considered to be specifically feminine: ease of use at the keyboard and the dexterity required for its handling were paramount. In the accounts given by the press on "Typographical machines" on the occasion of the 1844 exposition, the authors insisted on the ease and elegance of work

46. Joyce Burnette, "An investigation of the female-male wage gap during the industrial revolution in Britain," *Economic History Review* 50 (1997), 257-281.

47. In France, at the middle of the century, female salaries were on average 50% of male salaries in typography; see Frédéric Barbier, "Les ouvriers du livre et la révolution industrielle en France au XIX^{e} siècle," *Revue du nord* 63 (1981), 200. In Great Britain, this wage inequality was around 1/3 to 50%: see Patrick Duffy, *The skilled compositor: an aristocrat among working men* (Aldershot: Ashgate, 2000), 141. Also note that while, in typesetting, these salary differences could work in favor of mechanization, in other sectors, the low cost of a female workforce could have instead slowed the adoption of new processes by providing an alternative for growth in productivity.

48. *La Réforme* (June 16, 1844).

49. Delphine Gardey, "Mécaniser l'écriture et photographier la parole. Utopies, monde du bureau et histoire de genre et de techniques," *Annales HSS* 54 (199), 587-614. The expression is applied to the writing machine (594).

50. See Keith Grint and Steve Woolgar, "On some failures of nerve in constructivist and feminist analyses of technology," in *The gender-technology relation: contemporary theory and research,* ed. Keith Grint and Rosalind Gill (London: Taylor and Francis, 1995), 50. See also *L'engendrement des choses, Des hommes, des femmes et des techniques,* ed. Danielle Chaubaud-Richter and Delphine Gardey (Paris: Editions des archives contemporaines, 2002), 81.

51. According to the definition now widely accepted given by Joan W. Scott, "Gender: A Useful Category of Historical Analysis", *The American Historical Review*, Vol. 91, No. 5. (Dec., 1986), p. 1053-1075.

on the machine: all characteristics which make it a specifically feminine tool.[52] These technical characteristics (ease, grace, elegance) further correspond to feminine skills such as they were described by contemporary writings on political economy.[53] In simplifying typesetting work, the pianotype made the liberation of female labor potential possible. The seated position allowed by the new machine, unlike case work which required constant standing, constitutes another argument for regarding this technology as specifically feminine. In his presentation, Etienne Cabet notes that, in his opinion, with

> a little bit of practice and experience, typographical composition would become such an easy and even elegant task that ladies could be seated before a piano and fix in metallic characters the expression of their feelings and their thoughts with all the ease with which they now confer them to paper.[54]

In making the work easier, "less muscular," the machine would naturally allow the use of feminine talents. For the innovators, associating the typesetting machine with feminine labor doubtless inscribed it in a commercial strategy, still stumbling, aimed at showing printers the interest of an easy-to-use machine that allows the employment of a cheap workforce.

This is why the images diffused at the time frequently depicted the machines with young women operating them. The iconographic staging of the new method accentuated the process of "sexuating" the technical artifact. In the 1840s, numerous images of the "pianotype" circulated in the workshops of London and Paris in which a young woman, always elegant, sat before the machine as before a piano.

The one most frequently reproduced model was from an advertising prospectus of the Delcambre print shop, Breda street, which used this machine (figure 3 *above*). It was as if the dream would become real and confirm the gender imaginary of the "pianotype," and thus amplify the narrow association between this machine, its supposed ease of use, and the feminine sphere. In England, the newspaper *The family herald* reproduced it on the first page of each of its issues.

These images of women further attest to the inability, which one finds throughout the 19th century, to represent women at work. When one desired to depict female workers, they were most often shown in the kitchen, occupied by reassuring domestic tasks such as preparing meals or sewing. By representing

52. The majority of observers emphasize the "elegant" aspect of the machine: "the little machine that we have just named, quite elegant by the way, has the appearance of an upright piano" as read in *Le National* of June 23, 1844.

53. Scott, Joan W., "'L'ouvrière ! Mot impie, sordide…': Women workers in the discourse of French political economy, 1840-1860," in *The historical meaning of work,* ed. Patrick Joyce (Cambridge: Cambridge University Press, 1987), 119-143; "La travailleuse," in *Histoire des femmes en Occident*, ed. Georges Duby and Michelle Perrot (Paris: Plon, 1991), vol. 4, 479-511; M. Perrot, "Femmes et machines au XIXe siècle," in *Les femmes ou les silences de l'histoire* (Paris: Flammarion, 1998), 178.

54. Étienne Cabet, "Machine typographique à composer," *Almanach icarien astronomique, scientifique, pratique, industriel, statistique, politique et social pour 1843* (Paris: Mallet et Cie éditeurs, 1842), 91-93.

female laborers as engaged in the quintessential middle-class pastime constituted by the piano, these images participated in the impossibility of depicting a woman's industrial labor.[55] In addition, by disguising the harshness of the labor behind the apparent ease of middle-class domestic hobbies, they accentuated the female laborer's suspicions concerning a method that tended to make of their art a mere feminine and bourgeois pastime. It was only in the second half of the century that the machine was progressively represented without women operating them, as if in erasing the female typesetter they had hoped to ease the relationship that male workers had with the method.

Evidently, typesetting machines tested in print shops in the 1840s formed a complexe imaginary of the gendered division of tasks. By facilitating the employment of women and in transforming the art of typesetting into a feminine hobby, pianotype became, from its origin, narrowly associated with the feminine sphere. This imaginary dimension would contribute to orienting laborers' reception of the new method. In France as in England, indeed, the culture of typographical workshops remained marked by a strong masculine identity which made adapting to this feminine machine difficult. More than in any other trade, typesetting remained, up to the middle of the 19th century, a man's activity. Inserted into a diversified network of rituals and practices issuing from the corporative world of the Ancien Régime, the "monkeys" considered their activity as essentially masculine, and considered any attempt to introduce women into it to violate the honor of the trade.[56] In France as in Great Britain, the professional rituals would fall into a culture of masculinity: apprenticeship, for example, had been just as much an initial step towards producing free men as a period for acquiring the skills of the trade.[57]

Learning these skills themselves were conceived as a step in the masculinization process. The "chapel" possessed equally numerous rules that governed the behavior of workers: drink in particular – beer in England and wine in France – constituted a fundamental dimension of worker sociability ("drinking bouts" and meetings at pubs or the cabaret were very frequent). The fraternity of the workshop evidenced itself also by the taste for pranks and amusements in which each made a show of his sexual and physical exploits: "the workshop," concluded Philippe Minard, "thus mingled with the cult of

55. Anne Higonnet, "Femmes et images. Représentations," in *Histoire des femmes*, ed. Duby and Perrot, vvol. 4, 362. On the representation of the piano as a feminine and middle-class instrument, see Alain Corbin, "Le secret de l'individu," in *Histoire de la vie privée,* ed. Philippe Ariès and Georges Duby (Paris: Seuil, 1987), vol. 4, 486-489.

56. Sîan Reynolds, "The male compositors' culture," *Britannica's Typesetters: Women Compositors in Edwardian Edinburgh* (Edinburgh: Edinburgh University Press, 1989), 18-22.

57. Thus, notes P. Minard, "apprenticeship is the teaching of the age of man as well as of the trade" (*Typographes des Lumières* (Seyssel: Champ Vallon, 1989), 75); likewise, in the case of England, Cynthia Cockburn affirms: "As to the rituals of apprenticeship, it was unthinkable that a girl should pass through a process so clearly designed to produce a free man" (*Brothers: Male Dominance and Technical Change* (London: Pluto Press, 1983), 17.

physical values characteristic of a masculine culture of the triumphant body."[58] These workshop practices and rules prohibited women from finding a place in a space designed to create a close-knit community of interest at the heart of a fraternal universe conceived as masculine.

Emancipating the Slave from Work

These gendered representations of the machine blurred workers' identities.

They worried the artisans who fought against the entrance of women into workshops. They were equally in contradiction with the promises of emancipation of workers defended by some. Reinscribing the machine within the new "hygienist" preoccupations of the July Monarchy, Delcambre asserted that "this invention also protects the health of workers, too often violated in the ordinary print shop, from disease."[59] At the same time, indeed, several discussions taking place particularly in France returned the machine and the improvement of workers' conditions to the social question.

The socialists of the 1840s described the "pianotype" with a certain fascination, seeing in it a means of emancipating labor. In his *Almanach Icarien*, intended for workers, Etienne Cabet effused without restraint in 1842; speaking of the typesetting machine, he writes that if

> someone had perhaps dared to invent a machine which would replace the print shop typesetter with inanimate objects that perform that which they perform with their hands and their intelligence, it would have been decried as impossible and a folly to hope for […] This impossibility, this supernatural wonder, this miracle that formerly should have made the author worship it as a God or burn it as a witch, this miracle, we say, is a reality.[60]

Confronted by worker unrest with regard to these new mechanical methods, Cabet tried to couch the technical change in the language of artisanal autonomy to make it acceptable to journeymen printers.[61]

The socialist press defended the development of these techniques, in which it detected a means of emancipating labor. In *La démocratie pacifique*, the Fourierist Victor Meunier assured that the Young and Delcambre machine "replaces the exhausting work of the typesetter with a simple, easy, even elegant operation performed by a woman or child seated before the keyboard upon which she runs her fingers as over the keys of a piano."

58. P. Minard, "Travail et travailleurs," 148. Even if the process of industrialization began to modify this workshop culture, it still remained quite alive in the middle of the 19th century. On the ideology of apprenticeship in the 19th century, see Yves Lequin, "Apprenticeship in nineteenth-century France: a continuing tradition or a break with the past?" in *Work in France. Representations, Meaning, Organization, and Practice,* ed. Steven L. Kaplan and Cynthia J. Koepp (Cornell University Press, 1986). 457-474, and Keith D.M. Snell, "The apprenticeship system in British history: the fragmentation of a cultural institution," *History of Education* 25 (1996), 303-321.

59. AN, MC Et / LXVIII / 1008, Statutes of the "néo-typographie" joint-stock company.

60. Cabet, "Machine typographique à composer," 91-93.

61. On this aspect of the Icarian discourse, see F. Jarrige, "Des 'machines à l'infini': Le communisme icarien et l'imaginaire utopique des techniques (1830-1848)," in *Hypothèses 2005* (Paris: Publications de la Sorbonne, 2006), 199-208.

Later, he further assured that "the 6th volume of the complete works of Fourier, containing the *Nouveau monde*, is currently being typeset rapidly by this process."[62] But contrary to Cabet, Victor Meunier concludes his text by questioning the future of workers replaced by the mechanism:

> It will thus come about that these machines, which . . . should have directly resulted in freeing of some of our fellows from a tiring task and contributing to the good of man, will create a competition among men for whom labor is their sole resource.

Pierre Leroux, who himself had invented a method for typesetting, defended his technological experiments in response to criticisms already expressed by workers: "Never did I think that my discovery would be so harmful to my companions! It was because I had thought their slavery so painful that I thought it would be good to improve upon these arts to which we had been chained."[63] It appears that he did his apprenticeship with typesetter Herhan, under the Empire, and well understood the world of printing. Unlike the lawyer Cabet, Leroux addressed himself to workers in presenting himself as one of their own:

> What sad and monotonous labor is that of the print shop typesetter! People of the world imagine that the printer reads the books or at least the pages he composes; nothing of the kind. He only reads lines, or rather, letters. . . To earn his ten cents, he must have a mechanical skill, and be one who is not disrupted, not pleased to read the copy, nor to reflect upon it.[64]

Even so, his old workshop comrades who remained typesetters expressed a different opinion. Far from believing the promises of freedom made by the socialists of the 1840s, and in light of the degraded image of their work conveyed in this discourse, French and English workers would implement strategies to resist the use of these mechanisms.

A Negotiated Mechanization

To account for the failure of mechanical typesetting during most of the 19th century, the technical change must be reinscribed within the many negotiations that formed the texture of the new techniques. Over the course of the 19th century, the world of printing experienced a complete transformation of working conditions. Faced with these evolutions, typesetters, like press operators and proofreaders, implemented diverse forms of resistance that helped to slow the adoption of the new methods. They manipulated the discourse on mechanical typesetting so as to legitimize its rejection. Typesetters represented a sort of labor aristocracy amongst printing workers; they fought to keep control of the means of recruitment and for their identity. This quasi-invisible struggle,

62. Victor Meunier, "Machines typographiques," *La démocratie pacifique* (July 25, 1844).
63. Pierre Leroux, "D'une nouvelle typographie," *Revue indépendante* (January 1843), 275.
64. Pierre Leroux, *Revue indépendante*, 274.

which rooted itself in the day-to-day operations of the trade, would determine the failure of the first forms of mechanical typesetting.

Typesetters of France and England: an Aristocracy of Labor?

Despite its ambiguity and its polemical aspect, the notion of labor aristocracy is still useful for characterizing the singularity of some workers in the social field, their ability to control access to the trade, and the higher level of their salaries.[65] To understand worker reactions to the new methods of production, one must at the same time examine the position of typesetters in the workplace and the threats that caused fear of the introduction of mechanisms.

In England as in France, typesetters enjoyed a privileged position in the labor world. Many historians considered this activity as the archetype of skilled labor in the 19th century. Even if there are nuances to consider according to region and time period, it seems that typesetters earned more than other printing workers. In Paris, they earned 4 Fr on average in 1807, while printers (or proof runners) earned only 2 to 2.50 Fr. In the years 1844–1847, their salary reached 4.50 Fr, versus only 2 to 2.50 Fr for machine operators (two per mechanical press).[66] In the provinces, salaries generally stayed inferior.[67] Similarly, in England, typesetters earned more on average than most other artisans: 33 s. in 1801 and 36 s. in 1866, even if their relative position declined in relation to the rest of the labor world.[68] But, as in France, typesetters in the capital earned more.

The privileged position of typesetters appeared also in the regularity of their work, their level of qualification, and their ability to organize collectively. Thus, in this domain, too, typesetters proved their undeniable dynamism.

It was in England that forms of union organization emerged first: in 1826, the *London General Trade Society of Compositors* was founded; then in 1834, the *London Union of Compositors*; and in 1845, the typesetters of London united in the *London Society of Compositors*, which welcomed 1,751 members.

In the first annual report read before the society in January 1846, the question of newly tested machines for typesetting raised lively discussions.[69] In 1849, the *Typographical Association* emerged, uniting the different branches of the craft.[70] In France, where legislation against unions persisted much

65. Eric J. Hobsbawm, *Labouring Men: Studies in the History of Labour* (London: Weidenfield and Nicolson, 1968), 274; Robert Gray, *The Aristocracy of Labour in Nineteenth Century Britain* (London: Macmillan, 1981).

66. Paul Chauvet, *Les ouvriers du livre en France de 1789 à la constitution de la fédération du livre* (Paris: Marcel Rivière, 1956), 653.

67. F. Barbier, "Les ouvriers du livre et la révolution industrielle en France au XIXe siècle," *Revue du nord*, 201.

68. P. Duffy, *The skilled compositor*, 82-84.

69. See Ellic Howe and Harold Waite, *The London Society of Compositors (Re-Established 1848): a Centenary History* (London: Cassell, 1948).

70. Musson, *The Typographical Association*, and John Child, *Industrial Relations in the British Printing Industry* (London: Allen and Unwin, 1985).

longer, book laborers organized in a more clandestine manner. From the July Monarchy, however, a variety of associations for mutual aid and resistance emerged in Paris.[71] In 1839, the Parisian Typographers' Mutual Aid Society was created. In 1843, it managed to negotiate on an equal basis and have master printers from the capital agree on professional rates. It discussed reports with associations of the same type formed in Lyon, Nantes, Dijon, and Le Havre, as well as with London and Brussels.[72] The typographical society was legalized in September 1849 with the adoption of a specific regulation (art. 116) outlining in particular the exclusion of women, only small numbers of whom appeared in the profession at the time:

> Morale as well as the proper creation of work is in opposition with women being employed as typesetters. If it should be introduced into typesetting workshops, society members should always let the committee know and conform with its decision, which could only be made in favor of the exclusion of women and putting down [one's foot].

After a phase of retreat at the beginning of the Second Empire, militancy gained strength during the 1860s, resulting in the 1881 creation of the French Typographical Federation that united all the French typographical societies. Through these associations, French and English typesetters exercised a constant pressure on master printers; they sought to establish rates, to control access to the trade, in the fight against the entrance of women and against new machines.

Against the Feminization of the Trade

The history of printing workers in the 19th century is dominated by the fight against the feminization of the trade. The failure of mechanical typesetting is inseparable from this context. To profit from the inferior salaries paid to them, the industrialists employed more and more women for typesetting, which raised a constant opposition on the part of the [male] typesetters. In the classical descriptions of the trade, women have no place, the "corporate idiom" having been steeped in a masculine culture such that no formal interdiction of feminine labor was necessary.[73] In the first half of the 19th century, however, large-scale production and mechanization created numerous newsimple and repetitive tasks for which women were employed. In France as in England,

71. P. Chauvet, *Les ouvriers du livre en France*.

72. On the history of this typographical society, see *Les carnets de Joseph Mairet, ouvrier typographe. Histoire de la Société typographique parisienne et du Tarif (1839-1851)* (Paris: Fédération des travailleurs des industries du Livre CGT, 1995).

73. As Sîan Reynolds notes in a study dedicated to Scotland: *Britannica's Typesetters*, 19. Few recent works exist on this question in France, though it was in the print shop that the introduction of women into the world of the workshop raised the most debates and resistance on the part of comrades. In the French case, it should also be mentioned a unique experiment in employing women in print shops during the revolutionary period; even if this experiment failed quickly, it left undeniable traces in the memories of the profession during the 19th century: seeAlphonse Alkan (the elder), *Les femmes compositrices d'imprimeries sous la Révolution française, en 1794, par un ancien typographe* (Paris: 1862), 10, and Louis Radiguer, *Maîtres imprimeurs et ouvriers typographes.* (Paris: Société nouvelle de librairie et d'édition, 1903), 447.

this was first the case in the folding and sewing tasks entailed in bookbinding, tasks corresponding to traditional feminine social roles.[74] On the other hand, in the typesetting sector, the introduction of women raised strong opposition.

In the years preceding the invention of pianotype, more attempts at feminizing the typesetting workshop in France angered printing workers.[75] In 1831, Rignoux failed to establish a workshop of young women at Montbar.[76] In 1834, the Didot family, which had been established in the book industry for two centuries, decided to initiate a certain number of its female workers into print typesetting, who had until then been employed in the paper factory. A workshop employing only female typesetters was then founded at Mesnil: young female workers who barely knew how to read and write were instructed by the typographist emeritus, Théotiste Lefebvre.[77] In the same era, Crété also employed women in his print shop in Corbeil. In 1840, Arnold Frémy, collaborative journalist at *Charivari* and future professor on staff at Lyon, gave an account of the creation, in the small hamlet of Saint Gernay, between Paris and Fontainebleau, of a print shop composed exclusively of women charged with the tasks of correcting, printing, and typesetting. He saw in it a means of emancipation for "poor bourgeois women, small female shopkeepers," since, thanks to this work, the female laborer "is elevated to the rank of a priestess in the sacred temple of intelligence."[78] The justification for this experiment judged philanthropic, in *La Revue de Paris*, raised a lively reaction from workers at *La Ruche populaire*, under the pen of typesetter Coutant. Against the arguments of philanthropists, who saw in the labor a path for emancipating women, he denounced the commercial ulterior motives and the exploitation of female labor:

> Farewell, distaff and billhook; come, O! young villager-esses, come harness yourselves to this great typographical machine; stir with your weak arms this monster that vomits millions of prints; there is work that one would not give to a horse, since it would kill them in but a few days, and horses have to be paid for; but you are free merchandise; if you die, others will be ready to take your place, and that costs nothing![79]

74. Duffy, *The Skilled Compositor*, 130.

75. At the end of the July Monarchy, the entrance of women into print shops had already begun outside of bookbinding workshops where they had already long been present. In 1847, Frédéric Barbier counted 304 women employed in typographical print shops, or 6.7% of the workforce (plus 807 female workers who worked in the bookbinding and leafing workshops): "les ouvriers du Livre."

76. Ambroise Firmin Didot, *Essai sur la typographie, Extrait du Tome XXVI de l'encyclopédie moderne* (Paris: Firmin Didot, 1851), 867. Born in 1780, Thomas-François Rignoux was a former typesetter who grew wealthy after having acquired a printer patent in 1820. In 1830 he went bankrupt, which pushed him to try female labor, following which he became a printer on the faculty of medecine; see his necrology in *L'imprimerie* 15 (March 1865), 174.

77. Radiguer, *Maîtres imprimeurs et ouvriers typographes*, 452. On the Didot family which played an important role in the modernization of printing in France at this time, see the catalogue of the exposition presented at the BHVP in 1998, *Les Didot. Trois siècles de typographie et de bibliophilie, 1698–1998*, ed. André Jammes (Paris, 1998), 59.

78. Arnould Fremy, "L'imprimerie de Saint-Gernay," *Revue de Paris* 18 (June 1840), 285-299, quote on 288.

79. Jean-Baptiste Coutant, "Question industrielle et sociale," *La Ruche Populaire* (September 1840), 7-15.

In the 1840s and 1850s, the appearance of the first typesetting machines accelerated this movement; the workshops where they were used turning exclusively to female labor. Worker opposition to the employment of women became more serious. In 1855, women were for the first time introduced into a Parisian print shop. Up to this date, opposition of Parisian workers was such that feminization only concerned the new print shops on the periphery. In 1855, the Desoyl and Bouchet print shop, in a difficult commercial situation, decided to have "its typesetting executed by women placed under the supervision of a layout specialist."[80] The Typographical Society immediately pronounced a block on this workshop.[81] In 1859, another master printer, Mr. Guiraudet, confronted by the threat of the general desertion of all his workers, sent back a woman he had employed. But some time later, he replaced all his male typesetters with women![82]

Around 1860, the situation seemed to change rapidly and the number of women in printing grew. More and more, bosses took advantage of female labor to put pressure on their companions for whom independence seemed inadmissible at the hour of factory confinement.[83]

These conflicts began to settle in 1867 when a commission of the Typographical Society decided to accept the work of women under reservation of "equal salaries and identical working conditions, and apprenticeship."[84] Women's workshops multiplied as in the large print shop of Paul Dupont at Clichy, which the empress visited in 1865, or the workshop of the Havas agency, where five typesetting machines were operated by women in 1877.

In 1879, T. Lefevre set up a typesetting workshop as a philanthropic vocation composed of young sightless/speechless women in Mesnil Amelot.[85] In December 1876 again, several dozen typesetters held a strike to protest the establishment of special workshops composed exclusively of women in the print shop of Tolmer and Isidor Joseph in Paris.[86]

In Great Britain, women entering the typesetting workshops appeared much later. Apart from typesetting workshops using the pianotype at the start of the

80. Eugène Gauthier, "Annuaire de l'Imprimerie, de la presse et de la librairie pour l'année 1855-1856" (Paris: 1855), 30. Gauthier notes that on this occasion "the women's workshop, with workers for auxiliaries, is an old boys' network [*un sérail*: literally, 'a seraglio'], to say the least."

81. This appeared much more justified, as the previous year the former typesetter Auguste Boucher, from then on a master printer, published a small brochure in which he judged the employment of women "immoral"; see Auguste Bouchet, *De l'état de l'imprimerie parisienne en 1854* (Paris: Impr. de De Soye et Bouchet, 1854).

82. Radiguer, *Maîtres imprimeurs et ouvriers typographes*, 450.

83. So, in 1862 workers went on strike to obtain a raise in rates; this time several bosses decided to turn to women's labor to break the movement. This conflict gave way to a controversy and a debate over the course of the months of January and February in the columns of the paper *L'Opinion nationale*.

84. Barbier, "Une production multipliée," 195.

85. See *Typologie Tucker,* "Les compositrices sourdes-muettes, élèves de Mr. Théotiste Lefevre," 104 (July 31, 1879) and "Compositrices. L'introduction des femmes dans l'imprimerie française" 117 (March 15, 1880).

86. *Gutenberg journal* (February 1877).

1840s, and one little-known experiment in the Newton le Willow workshop in 1848, feminization began really around 1860. This gap between the two countries can be explained by the precocity of experiments in the organization of the British typesetters, which allowed them to resist more effectively than their French homologues to the transformations of industrialization.[87]

Across the Channel, reformers and philanthropists played a decisive role in the employment of women for typesetting.[88] In 1860, the reformer Emily Faithfull launched the "Victoria Press" in London with much publicity.

Established with the intention to provide skilled work for middle-class women, this initiative, perhaps more than any other, contributed to identifying typesetting as a feminine activity.[89] All these experiments raised opposition from the Typographical Association. Upon the Parisian strikes of January 1862, the French workers were supported by a loan from the London society of typesetting workers, which shows a certain degree of international cooperation in the struggle to maintain the typesetting room as a masculine space.[90] In France, as in England, the typographical workshops of the middle of the century echoed with grumbling caused by the introduction of women into the trade. Attempts at mechanization heightened their fears: by favoring the employment of a workforce that was deemed illegal and paid at a lower rate, pianotype participated in the degradation of the typesetter's status.[91] The reception of the typesetting machines in the labor world is thus indissociable from these struggles that dominated the profession beginning in the middle of the 19th century.

Diffuse Opposition to New Processes

Over the course of the first half of the 19th century, printing workers opposed the new machines several times. In France, press operators broke mechanical

87. Duffy, *The Skilled Compositor*, 135; Reynolds, *Britannica's Typesetters*, 149 n12; Felicity Hunt, "The London Trade in the Printing and Binding of Books: an Experience in Exclusion, Dilution and Deskilling for Women Workers," *Women's Studies International Forum* 6 (1983), 517-524, 519. Elsewhere, this explanation was advanced by French workers themselves in the reports of the delegates for French typography at the universal exposition of London in 1862.

88. The year 1860 undeniably constituted a turning point in this regard; in Scotland, for example, it was only after this date that women began to enter en masse into typesetting from which they had previously been totally excluded: see Reynolds, *Brittanica's Typesetters*.

89. See also James D. Stone, *Emily Faithfull: Victorian Champion of Women's Rights* (Toronto: P. D. Meany, 1994).

90. Duffy, 137.

91. In Great Britain and in France, the fight against illegal workers – meaning not having undergone the normal period of apprenticeship or not respecting rates – like novices (*alloués*) in the 18th century, remained a demand of the first order during the 19th century. In 1862, delegates of French typography specified that "if we fight against the introduction [of women] amongst us, – is it not, if we must say it, a sex against which we fight? It is an instrument for lowering salaries, a reduced-price worker. We fight against woman the way we fight against all low-cost typesetters, whatever their sex or age" (*Délégations ouvrières à l'exposition universelle de Londres en 1862. Rapport des délégués de la Typographie suivi du nouveau Tarif* (Paris: Chez les membres de la Commission ouvrière et chez les délégués, 1863), 26).

presses in 1830 and in 1848. Soon after 1830, they demanded the interdiction of both mechanical presses and cliché plates.[92] In England, there was no violence of this type although, in 1830, bookbinders rejected the use of a new method accused of "reducing [them] to misery."[93] Typesetters never used violence to resist the introduction of "pianotype" and its successors into the workshop. They turned to more subtle forms of negotiation and pressure that, accounting for the productive structure of the 19th century print shop, allowed them for a long time to keep the new machines at a distance.

Indeed, typesetters were frightened by the increasing number of attempts to mechanize typesetting work. As the worker Antonio Watripon confirmed in 1842, "the thought that occupies, at this hour, all the souls in the typesetting workshop is that of the future of the industry and its safety, in the presence of the recently discovered typesetting machine."[94] Parisian typesetters crowded into the 1844 exposition to observe the machine that should replace them.

"The typographical keyboard of Messrs. Young and Delcambre," noted the editor of the *Typographical bulletin* in his account of the exposition, "is the product related to typography that draws the most attention from visitors at the exposition: it is constantly surrounded by a crowd of typesetters who come, not without some concern, to examine its curious work and ask themselves if it brings the next revolution in the profession."[95]

In his journals, typesetter Joseph Mairet confirms the keen anxiety that gripped the printing world in the 1840s: he deplored the "murderous and immoral competition [that] machines create for human labor."

For Mairet, who published his text at the end of his life, once mechanization seemed inescapable, "individualism [must] be replaced by the association, and employment of machines become a great benefit, because, in this case, they benefit everyone, and take over labor without eliminating the laborer."[96]

In 1855, Delcambre himself complained at the same time of "the indifference of printers towards improvements which could contribute to the advancement of the art of typography" and "opposition on the part of workers against his machines."[97] Several testimonies emphasize further that Delcambre was "discredited in the typographical world" and that as "an inventor of a distribution machine system, he made some enemies."[98]

92. Madeleine Rébérioux, "Les ouvriers du livre devant l'innovation technologique. Esquisse d'une réflexion," *Histoire, économie et société* 2 (1986), 223-232.

93. Cited in Ellic Howe and John Child, "Bookbinders Versus Machines," *The Society of London Bookbinders, 1780–1951* (London: Sylvan Press, 1952), ch.7.

94. "Enquête industrielle – Les imprimeurs-typographes," *Le Populaire* 9 (December 11, 1842). This testimony shows that, well before its public unveiling at the industrial exposition of 1844, Parisian typesetters followed attentively the advances of mechanization in their work.

95. *Le Bulletin typographique* 21–22 (May and June 1844).

96. *Les carnets de Joseph Mairet*, 138.

97. *Rapport du jury international de l'exposition universelle de Paris en 1855*, 340.

98. AN, F18 1754: Parisian patents file (Paris: August 6, 1853), report by the public safety director.

In England as well, the union press attested to the strong opposition sustained by the arrival of new typesetting machines in the 1840s.

Typesetters expressed the fear that these would reduce them to the miserable status of a simple hand-weaver. The *Compositors' chronicle* (1841–1843) then *The printer* that succeeded it in 1843, reported some of the concerns and discussions raised around the profession by the Young and Delcambre machine. They were described as "quite dreaded novelties;" the *Compositors' chronicle* feared that "the introduction of machines into this branch that supplies nourishment to honest and honorable laborers" could not lead but to a rise in unemployment and misery. Similarly, *The printer* asserted that the success of this machine would deprive the worker of subsistence. The *Midland board of the national typographical association* opposed, for its part, the introduction of the machine of Rosenborg into Hull in the middle of the 1840s.[99] In the same era, a rumor according to which the proprietors of the *Times*, Andrew Spottiswoode and John Walter, were in the process of acquiring a new pianotype worried London typesetters.[100] The pressure exerted by the latter contributed largely to the staving off of new typesetting machines. In the 1860s, several models were propagated in the provinces where the union strength of typesetters was weaker. London, on the other hand, had to wait for the 1890s to see the first models of mechanical typesetting machines begin to spread. In 1891, when the proprietor of the *Daily news* had six Hattersley machines installed, and was looking to employ a female workforce to handle the distribution machines, the London Society of Compositors issued an immediate protest that blocked the industrialist's initiative. Elsewhere, at this time, the linotype competition that emerged definitively relegated the first mechanical typesetting methods to the background.[101]

Worker resistance to the new methods took the form of a technical and ethical demonstration of the impasses of mechanization. Workers disputed their bosses' technical arguments point by point. On the occasion of their report on the universal exposition of 1862, they affirmed that they could not "admit that the diminution and degradation of the worker's salary should be a necessary consequence of industrial progress." In 1867, they added that

> without wishing at all to harm the interests of the inventors, we frankly state that we do not have faith in their success. The intelligent typesetter will always do better alone than a machine that requires the employ of two people; he may move fewer letters, no doubt, but the work accomplished would be complete, well done, and without need for retouching.[102]

99. Musson, *The Typographical Association*, 20; *Compositors' Chronicle* 19 (March 1842); and *The Printer* 13 (November 1844); see also Musson, 50-52.

100. Apparently without basis: Howe and Waite, *The London Society of Compositors*, 226.

101. Howe and Waite, *The London Society of Compositors*, 230.

102. *Délégations ouvrières*, 22-28; "Rapport de la délégation des typographes," *Exposition universelle de 1867*, vol. 1, 7-8.

Confidence in the intellectual superiority of the case worker lasted a long time. Giving an account of the Kastenbein machine at the end of the 1870s, a typographer from Nancy writes:

> To those who fear its introduction, I say: Fear not; the machine is improved; it will be still more improved upon; but it will never be but a machine; it can never read a good manuscript, and certainly never decipher a bad one![103]

The work of mechanisms was perhaps more rapid, but it never reached the perfection of that by hand. Similarly, typographers from the *Atelier*, in an article dedicated to the Young and Delcambre pianotype, demonstrated at length the limits of this new machine.[104] After having enumerated the technical impasses and insufficiencies of the new method, the workers disciples of Buchez concluded their critique of the machine by stressing the problems posed by the employment of women:

> We conclude by condemning this general tendency of inventors, who always count on the work of women and children to implement their inventions. What could men do if they were everywhere balked by such competitors?

The editors of the *Atelier* did not place themselves in the context of a global contestation of mechanisms, which made their complaint inadmissible in the context of a new-born scientific and technical optimism.[105] For them, the machine raised first problems of morality related to female labor. They concluded by emphasizing that "if a committee of patents of invention were created as we had demanded in our last issue, it would declare dangerous and harmful to society all the machines that could only be operated by shamefully exploiting children and women."

For English and French typesetters from the middle of the 19th century, it was useless to break the new technology; reasserting the rules of the trade was sufficient to block any advance of mechanization. Workers elaborated upon a veritable moral discourse that made use of the philanthropical ambitions of their opponents. Even if they could, women should not work in the room with male typesetters. By engaging in this activity, they would lose their femininity and their identity. There was in addition a great danger in letting women read all the texts that passed through the workshop, as some could contain subjects poorly adapted to their sex. In working too long in the proximity of men, in hearing the language used in workshops, and more generally in being

103. J. Marchal (typographical worker), *Rapport sur la machine à composer de M. Kastenbein* (Nancy: Imprimerie de Gebhart, 1878), 4.

104. "Machines – pianotype de MM.Young et Delcambre," *L'Atelier* 10 (July 1844). A large number of typesetters were found among the workers of L'Atelier; see Rémy Gossez, "Presse ouvrière à destination des ouvriers, 1848-1851," in *La presse ouvrière, 1819-1850,* ed. Jacques Godechot (Paris: Bibliothèque de la révolution de 1848), vol. 23, 1966.

105. Elsewhere, in 1848, the workers of *l'Atelier* hastened to condemn the breaking of new machines that took place in the capital; outside of an article titled "Ne brisons pas les machines!" the Atelierites had a printed poster affixed to the walls of the capital asking workers no to break the machinery; see *L'Atelier* 6 (February 27, 1848).

in contact with the masculine culture that dominated there, did the women not risk losing their femininity?[106] It was in response to these arguments that female typesetter workshops were supervised by priests and isolated far from those of men. In the Clichy branch of the Paul Dupont print shop around 1860, for example, "detailed precautions were taken to isolate workshops from the other sex," which Turgan lamented in adding that "Mr. Paul Dupont ceded in this to the susceptibilities exaggerated by adversaries of women's labor."[107]

Through these arguments, hidden in the secret of the workshops, male typesetters exercised a constant pressure against the use of mechanisms. In the image of the syllabary typesetting system that failed because of multiple "workshop pranks," mechanical typesetting processes endured, raising numerous skirmishes between mastersbosses and typesetters.[108] This worker resistance was effective, since it was founded on the singularity of the productive structures of printing that remained dominated by a small business model and the "rank and file of small workshops" putting up a tenacious resistance to technical transformations. In England, apart from some early exceptions like the *Times* print shop, typesetting workshops remained small for a long time, close to an artisanal model. In France, the census of 1851 counted 627 workshops employing 6,657 workers in the 77 known departments (the Rhône and Paris excluded), for an average of just 11 workers per shop.[109] In these conditions, only a minority of Parisian printers, in close proximity to sources of power and at the heart of the editorial market, were in a place to sufficiently control a market to necessitate the formation of much larger workshops. In 1861, the situation had sensibly evolved, as F. Barbier surveyed 24 workers on average per shop. Faced with even more staggering methods, which did not help with justifying lines or distributing characters, and which required a relatively large staff to operate them, printers hesitated to make the necessary investments, which would have created some outrage among the workers, or even caused the barring of their workshop. The purchase of mechanisms really implied a

106. Ava Baron stresses this point: see "Technology and the Crisis of Masculinity: the Gendering of Work and Skill in the US Printing Industry, 1850–1920," in *Skill and Consent: Contemporary Studies in the Labour Process,* ed. Andrex Sturdy, David Knights, and Hugh Willmot (London: Routledge, 1992), 67-95.

107. Julien Turgan, "Imprimerie administrative de Paul Dupont," *Les grandes usines de France: tableau de l'industrie française au XIX^e siècle* (Paris: 1860-1865), vol.4, 314.

108. "'Why was syllabary composition, which is employed in New York, abandoned in France?' asked A. Jeunesse. 'Because M. Joostens, who made so many sacrifices to perfect his case, was the butt of incessant annoyances from his workshop companions, and who more than once – he confided his pains to us – he found mornings that in the many sections of his case all the characters he had carefully arranged the night before had been mixed up. The workshop pranks were the reason for his energy.'" Auguste Jeunesse. "L'imprimerie et les livres," in *Etudes sur l'exposition de 1867*, 152. On the secret culture of the workshop in England and its function of preserving worker control over the work space, see Clive Behagg, "Secrecy, Ritual, and Folk Violence: the Opacity of the Workplace in the First Half of the Nineteenth Century," in *Popular Culture and Custom in Nineteenth-Century England,* ed. Robert D. Storch (London: Croom Helm, 1982). 154-179.

109. F. Barbier, *Livre, économie et sociétés industrielles en Allemagne et en France au XIX^e siècle (1840-1914)* (Diss., Université Paris 1, 1986), 758-765.

disruption of the organization of labor at the heart of the workshop, a challenge of the ethical economy of the trade.

Now, far from being a pure capitalist moved by the rationality of *homo economicus*, the master printer of the middle of the 19th century remained embedded in the networks of the corporative world concerned with maintaining order in the workshop.

Progressively, the concentration of workers in the ever larger and larger studios would accentuate the depersonalization of employee relations. New production reports, by de-structuring the old workshop solidarities, would promote the emergence of a new relationship with the technique suitable for the introduction of novelties at the end of the century. This new rapport with technique that emerged at the end of the 19th century appeared in the judgement issued by a unionized master printer, just before the arrival of linotype in France:

> I see in the introduction of typesetting machines an economic revolution most beneficial in the print shop. – Recovery of salaries, formidable increase in characters or presses (one or the other, if not both), – disappearance of small print shops that, surviving from day to day, are always ready to consent to exaggerated discounts for clients rather than going without work, – and, who knows? Maybe also the female typesetter will sign the act expelling woman from the print shop.[110]

From this point forward, far from threatening the worker's condition, social identity, or masculinity, the machine became a potential tool for restoring a trade in crisis.

Beginning in the 1880s, the technical course of mechanical typesetting was little by little supplanted by female "typecasting compositors" who transformed the very logic of the typesetting work directly inherited from Gutenberg.

Unlike typesetting machines, which remained inscribed in the traditional technical system by continuing to work directly on characters, the new technical course rested on the pairing of two operations, casting and composition.[111] This new system spread rapidly: the size of large press businesses in a context of growth henceforth allowed less risky investments than before; in addition, worker resistance seemed to calm greatly.[112] Instead of opposing a mechanization that seemed inescapable within the new socio-economic context, printing workers endeavored to "regulate its arbitrary nature by setting rules of hourly production and salary."[113] In England first, linotype entered quickly into workshops: in 1895, according to a union study, 250 linotypes operated in

110. "De la justification par les machines à composer," *La compositrice, organe des travailleuses du livre* 2:4 (April 1, 1888).

111. Barbier, *Livre, économie et société*, 589–591.

112. Even if typographists of the Midi attempted, unsuccessfully, to organize a "resistance union" to put the linotype used by the *Dépêche de Toulouse* out of working order. As M. Rébérioux writes, it seems that "this was really the end of the fight against the machine" (*Les ouvriers du livre et leur fédération. Un centenaire, 1881–1981* (Paris: Temps actuels, 1981), 59).

113. Rébérioux, "Les ouvriers du livre," 223–233.

the provinces as opposed to 33 Hattersley typesetting machines and 14 of the Thornes model. Employers, learning from the failure of attempts at mechanical typesetting, tried to gain the support of unions by employing skilled workers. Instead of opposing the new method, worker organizations tried to keep control by imposing regulations on their use.[114] They fought too for control over the typesetting room, henceforth populated by machines, as a masculine space.[115] Largely influenced by the English experiences, the French Federation of printing workers had a penalty adopted in 1900 that would ease the potentially subversive effects of machines: the operators of the new machines should be chosen among the typesetters of the house, and only those workers having undertaken a normal apprenticeship could be admitted to work with the machine.[116] These measures allowed them to largely maintain the masculine monopoly over typesetting work, and the linotypist emerged rapidly as the image of the well-paid, skilled worker. Definitively, the mechanization of typesetting was the result of a compromise that ended several decades of fighting and experimentation.

In these conditions, the history of experiments in mechanization that preceded the diffusion of linotype is not only the recital of vain utopias or technical failures. It is first the result of a slow process of acclimatization by which new machines are introduced within a process of constant negotiation between actors implied in the innovation. To spread and be accepted, the innovation had to construct for itself a favorable socio-technical environment. But, in having been early identified with the work of women, against which the male workers fought, mechanical typesetting failed to be inculcated in workshop culture.

Far from the classical linear model that sees in pianotype an embryonic ancestor of linotype, we must substitute "a swirling model" that allows for following multiple socio-technical negotiations that gave form to the innovation.[117] In the case of pianotype, the negotiation concerned essentially the gender of the machine: faced with printers suspicious of employing a cheap female workforce to work the new methods, typesetters reaffirmed the sexuated identity of the trade to fight against competition from an underpaid workforce.

114. Jonathan Zeitlin, "Engineers and Compositors: a Comparison." in *Divisions of Labour: Skilled Workers and Technological Change in Nineteenth Century England,* ed. Royden Harrison and Jonathan Zeitlin (Brighton: The Harvester Press, 1985), 185-250. For a study of the social consequences of the introduction of linotype in England, see David A. Preece, "Social Aspects and Effects of Composing Machine Adoption in the British Printing Industry," *Journal of the Printing Historical Society* 18 (1983/1984), 1-35.

115. Cockburn, *Brothers*, 31.

116. Radiguer, *Maîtres imprimeurs*, "tarifs de la Machine à Composer. A l'étranger. En France," 477-490.

117. For a theoretical approach to the "whirlwind model" of innovation, see the classic article by Akrich, Madeleine, Michel Callon, and Bruno Latour, "The key to success in innovation part II: the art of choosing good spokespersons," trans. Adrian Monaghan, *International Journal of Innovation Management* 6 (2002), 212.

Far from the grand narratives of industrialization for which progress advances inescapably through the unveiling of technical improvements, this socio-historical approach of technical change pays attention to actors' negotiations and plural discourses. In retrieving the aspect of indeterminacy that is at the heart of technical change, and in demonstrating that any technical apparatus incorporates the definition of its possible social uses, we can sketch the conditions for a more democratic control of technology.[118]

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118. Andrew Feenberg, *Questioning Technology* (London: Routledge, 1999).

Abstract

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The Gender of the Machine
Printing Workers and Mechanical Typesetting (France, England, 1840–1880)

In the 19th century, the "typographical Ancien Régime" gave way to the era of industrial print production. Though printing changed rapidly in the first half of the 19th century, the typesetter's task of assembling lead characters changed but little before the introduction of linotypes at the turn of the 20th century. Such stability of the technical system, generally explained by the imperfection of mechanical typesetting methods, is actually rooted in the complexity of social relationships and cultural issues raised by the new processes. In France, as in England, the first typesetting machines developed during the 1840s were associated early on with women's work. Manufacturers played on this identification to promote machines that allowed them to use a cheap workforce. From their side, printing workers harnessed the sexuated dimension of technical artifacts to preserve their work space. Neither an inexorable transformation nor technical impossibility, the change in typesetting methods finally emerged from a slow process of acclimatization and negotiation between the different actors of the print world.