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Journeymen Paperworkers, the Industrious Revolution, and the Industrial Enlightenment in Europe, c. 1700–1800

This article considers how the realities of hand papermaking framed the search for a papermaking machine. The manufacturers longed for a device that would sever the links joining the journeymen's skills, custom, and familiar output, and produce vastly more paper. The absence of an industrious revolution in papermaking and the modest contributions of the industrial Enlightenment to the trade intensified this drive. A mechanized mimic of the journeymen's skills, the papermaking machine put an end to their mechanical art.

In 1989, Bruce Laurie, a distinguished American historian, published a volume entitled "Artisans Into Workers: Labor in Nineteenth-Century America"[1] The title reveals Laurie's vision of the "great transformation" that turned independent, petty producers into machine tenders. Throughout Europe and America, however, journeymen paperworkers had always been "factory artisans". Despite the manufacturers' reliance on skilled men and their mastery, hand papermaking was a capitalist industry cloaked in a corporate idiom. Neither E. P. Thompson's depiction of the moral economy of the marketplace, nor Jan de Vries's account of a new market orientation in worker households captures the trade's social relations of production.[2] The journeymen fashioned reams for markets rather than for their own use, and invariably did so under the watchful gaze of a millmaster. They depended on wages as well as the provision of food. Nevertheless, paperworkers across Europe still spoke of masters, journeymen, and apprentices, recognized standards for proper entry into each rank, and celebrated their brothers' passage up the craft ladder. These practices persisted despite the absence of formal production guilds in French papermaking and the English industry's freedom from the Statute of Artificers (1563). So the paperworkers' identity, motives, and powers had distinctive sources and forms of expression. They had no place in Laurie's formulation.

This article considers the lived experience of making paper by hand, and how the trade's particular features shaped the machine that displaced it. Recent study of how early modern European technology was "learned, operated, and invented" has given rise to a forest of eloquent concepts, including "expertise and experience", "learning by doing", "the mindful hand", and "trading zones"[3] (the last two phrases refer less to an actual appendage or physical sites and more to exchanges between natural philosophers and artisans.) Certainly, these terms rest on numerous,

finely etched studies of past production. But these comprehensive distillations tend to sacrifice the diversity of technological practice and change that enlivened this production. The grittiness and grime that marked every Old Regime trade (and tradesperson) also melt away. Equally, the joys and cruelties of time on the road and the pride and rage generated by every craft's exactions lose their bite. Only by examining hand papermaking as a whole, with its own terms of work, custom, mastery, and survival can we assess how mechanized papermaking emerged from this art.

Much of the current debate about the interplay of technological change, economic growth, and labor practice in early modern Europe centers on two concepts: the "industrious revolution" and "industrial Enlightenment". Jan de Vries, who coined the phrase industrious revolution, claimed that worker families during the period 1650–1800 *chose* to spend more days at work and labor longer hours, often at greater intensity, in order to consume ever more imported commodities and manufactured goods.[4] As a result, producers pursued machines and intensified the divisions of labor in their trades to satisfy the spiraling demand for furnishings, razors, and famously, mirrors. My explorations of the hours and efforts of journeymen paperworkers tell a different tale. These skilled hands already sweated through exhausting days at the outset of de Vries's era of newfound industriousness. Moreover, their hours framed precise production quotas, which were accompanied by downtime compensation (if the master was responsible for the disruption) and overtime premiums. These standards reassured manufacturers in search of regular productivity and workers fearful of exploitation that the familiar day's work remained the order of the day in their trade. They also reflected the delicate nature of the product: masters and journeymen alike knew they had to both "speed up" and "take their time" to turn out quality paper at the expected rate.[5] So fatiguing workdays, precision, and time-discipline characterized hand papermaking long before the mechanical rhythm of the papermaking machine.

According to Joel Mokyr, the "industrial Enlightenment" was at once a set of institutional transformations and a cultural campaign that exposed "tacit artisanal *savoir-faire*" and its supposedly inflexible nature to the sunlight of scientific inspection. Yet Mokyr conceded that "the bulk of innovation in manufacturing and agriculture before 1800 advanced without science providing indispensable inputs". Instead, he ascribed these changes to "experience-driven insights, trial and error", and good fortune. The inventor of the papermaking machine would have added the trials of governing the toil of skilled, willful hands as the mainspring of his work.[6] To understand how papermaking was learned and practiced, we must first journey inside a paper mill.

Hand paper mills generally consisted of two buildings, with an upper story in at least one structure. On the ground level, discarded linen, unraveling ropes, and stained, torn sails were sorted, paper was made, and newly minted sheets were glazed; the elevated workshop served as a drying loft. The creaking of carts loaded down with baskets of these dusty and sodden materials signaled the beginning of the papermaking season. The rag merchants who brought the cast-off linen to the mills knew they had a valuable commodity. In 1784–1785, James Whatman II, England's premier papermaker, observed that rags accounted for 47.5 percent of his production costs. At the same time, the wages Whatman paid added up to 14 percent of his expenses.[7] Before large-scale mechanization, materials were inevitably more expensive than men, even those who had hard-won skills. Rising wages alone, then, did not prompt the coming of the papermaking machine.

The division of labor and basic manipulations of hand papermaking were shared in mills across Europe. Effectively, production consisted of three stages: the rotting and mechanical reduction of discarded linen into pulp, the creation of the paper, and the preparation of the infant sheets for ink and transport. Female hands divided white rags from gray, removed caked dirt, and cut away matted patches. If their work was hasty or indifferent, the women could damage the pulp, so the master papermakers of Berne prescribed the maximum weight of rags they should "cut" each day.[8] An experienced man watched over rows of stamping mallets that separated the linen, already weakened by a customary period of fermentation, into cellulose filaments. He knew that the fermentation had proceeded long enough when he could feel the proper degree of heat in a handful of pulp. By the close of the eighteenth century, Dutch, English, many Scandinavian, and some French manufacturers had dispensed with fermentation and turned to a machine, the Hollander beater, that macerated old linen quickly. This device sped up the preparation of the pulp, but the journeymen who used this material still turned out the usual five reams of paper each day.

The vatman, who actually created the sheets, first evaluated the color and consistency of the pulp, the surest guide to the final weight of the ream. Then he dipped his mold, a rectangular, wire mesh bounded by a wooden frame, into a tub partially filled with the warm, watery material. He lifted the mold quickly and shook it in a time-honored pattern so that the fibers of the infant sheet "shut". Depending on the scale of the mold and its stringing (and hence the size and weight of the paper), he generally performed this task about 3000 times per day. After fashioning each sheet, the vatman passed the mold, with the fresh paper clinging to its wires, to the coucher, whose primary tool was a stack of hairy felts. He needed steady hands and good timing, since he transferred six or seven sheets of paper per minute from wire to felt. Once his pile of woolen felts, each now bearing a moist sheet of paper, reached a certain height, it was known as a post. Then it was pressed.

The layman separated the paper from the felts, a delicate task that resulted in many ruined sheets. More pressing followed and the paper was draped over cords to dry. The sizerman collected the still moist sheets and immersed them in an emulsion of hides, hoofs, tripe, and alum. This gelatin bath filled the paper's pores, thereby

preventing ink blots. The sizerman tested his work with his tongue: if it left a balanced impression on the sheet that resembled a fan or a butterfly's wing, the glaze was good. Finally, women sorted and smoothed the paper, excised stained and clotted swatches, and assisted the loftsman in wrapping the reams. Though rich in custom and lore, papermaking was always a precise industry. The romantic image of the languid, self-directed pace of the independent artisan misses much of the activity in pre-mechanized paper mills. Here journeymen and women workers labored at closely integrated tasks. Although certain hands still exercised some control over the rhythm of their toil, the lowly apprentice who failed to stir the pulp at the base of the vat at regular intervals put the quality of the paper at risk. If the supervisor of the stamping mallets failed to rouse himself from sleep during heavy rains, turbulent, muddy water flooded the troughs and discolored the pulp. Exacting time-discipline had always been a feature of papermaking; its presence showed in every sheet. Moments mattered. There was little available production time for the intensified hours of labor that de Vries maintains newly industrious workers increasingly chose.

How, then, did youngsters learn the art of making paper by hand? In a word: slowly. Very young children gathered the scraps of rags and ropes that slipped out of the sorters' bin, and they crossed shop floors littered with flawed, crumpled sheets, and puddled with spilled finish. Above all, they were members of papermaking families. To control the labor market and the rewards for their work (to the extent they could), journeymen paperworkers labored tirelessly to keep their ranks thin, familial, and initiated in the workers' custom, known in France as their *modes*. The men who were engaged in the trade in Angoumois reserved apprenticeships for their sons and brothers, and "formed a race distinct from the population in the midst of which they lived".[9] Veteran hands evidently refused to labor without additional compensation beside skilled men who had not been born into the trade. Even the millmasters, said the journeymen, had to possess the proper pedigree, or pay the company of workers for its absence. No doubt the journeymen squeezed their bosses for every possible *sou*, but this custom also ensured that the master knew his trade and the workers' self-styled ways.

In early modern France, apprenticeships in papermaking ranged from three to six years, with four years as the term specified by royal edict in 1739. According to one authority, German paperworkers endured indentures of "4 years and 14 days".[10] Even after the legal basis for the prosecution of violators of apprenticeship law disappeared in England in 1814, the journeymen paperworkers mandated that "no one shall be entitled to the business unless he has served a legal apprenticeship of seven years and can produce his lawful indenture". The exception: "The eldest son of a paper-maker, who is deemed to be a worthy member at the age of twenty-one, provided that he is brought up to the trade".[11] That said, every English paperworker was expected to carry his "card of freedom", the credential his trade union issued to acceptable journeymen, or else find work in another trade. Put simply, skill, family ties, and a firm grasp of his brothers' custom earned a journeyman his welcome and keep. The paperworkers' skill served as the cornerstone of their custom, this custom sheltered the journeymen's skill, and custom and skill together ensured the workers' collective control of the labor market.

In time, a skilled apprentice might become a sort of bound journeyman. Perhaps the veteran journeymen recognized these maturing novices as low-priced competition. Accordingly, the master papermakers of the Auvergne conceded, in 1688, that apprentice vatmen, couchers, and laymen would enjoy the same perquisites as the journeymen who performed these tasks.[12] Meanwhile, the fully fledged journeymen taxed newcomers often, claiming these fees were compensation for the clumsiness of the youths and the hours spent instructing them in the tricks of the trade. There was always a trade-off between teaching and working, but one producer, doubtless echoing many others, lamented that these indemnities were "legitimately due to the master", since "no worker has ever taken the pain, even once, to demonstrate the craft to [an] apprentice". The manufacturer's bitterness aside, the journeymen *were* quick to demonstrate their elevated status to the indentured: a Parisian apprentice courted trouble when he refused to open the doors for the veterans, "as is customary".[13]

In 1801, the master papermakers of Kent and Surrey pledged to stand together against the "wanton unnecessary and *extortionate demands*" of the journeymen.[14] They would oppose the workers' "*regular system of constant encroachment* on the *fair* and *established* customs and usages of the trade".[15] But the manufacturers' resistance was hamstrung by their reliance on the journeymen's skills. Across Europe, every paperworker learned the value of this dependence before he became a layman or layboy, as this post was known in England.

Successful paper production depended on accessible markets, timely weather, a full storeroom of old linen, the absence of catastrophic disruptions, and a ready supply of capable journeymen. Few manufacturers could count on all of these assets for very long. While some paperworkers and their families took to the road to avoid tight-fisted or abusive masters, the manufacturers also turned them out quickly when production ceased. Whether a journeyman relied on his "card of freedom" or his *livret* (an internal passport signed by a recent French boss) to land his spot, he

1 "The vat crew": Papetterie, Plate X (details of skills and tools of papermaking), in Denis Diderot and Jean le Rond d'Alembert, Encyclopédie, ou dictionnaire raisonné des sciences, des arts et des métiers, volume 26, planches 5 (1767).

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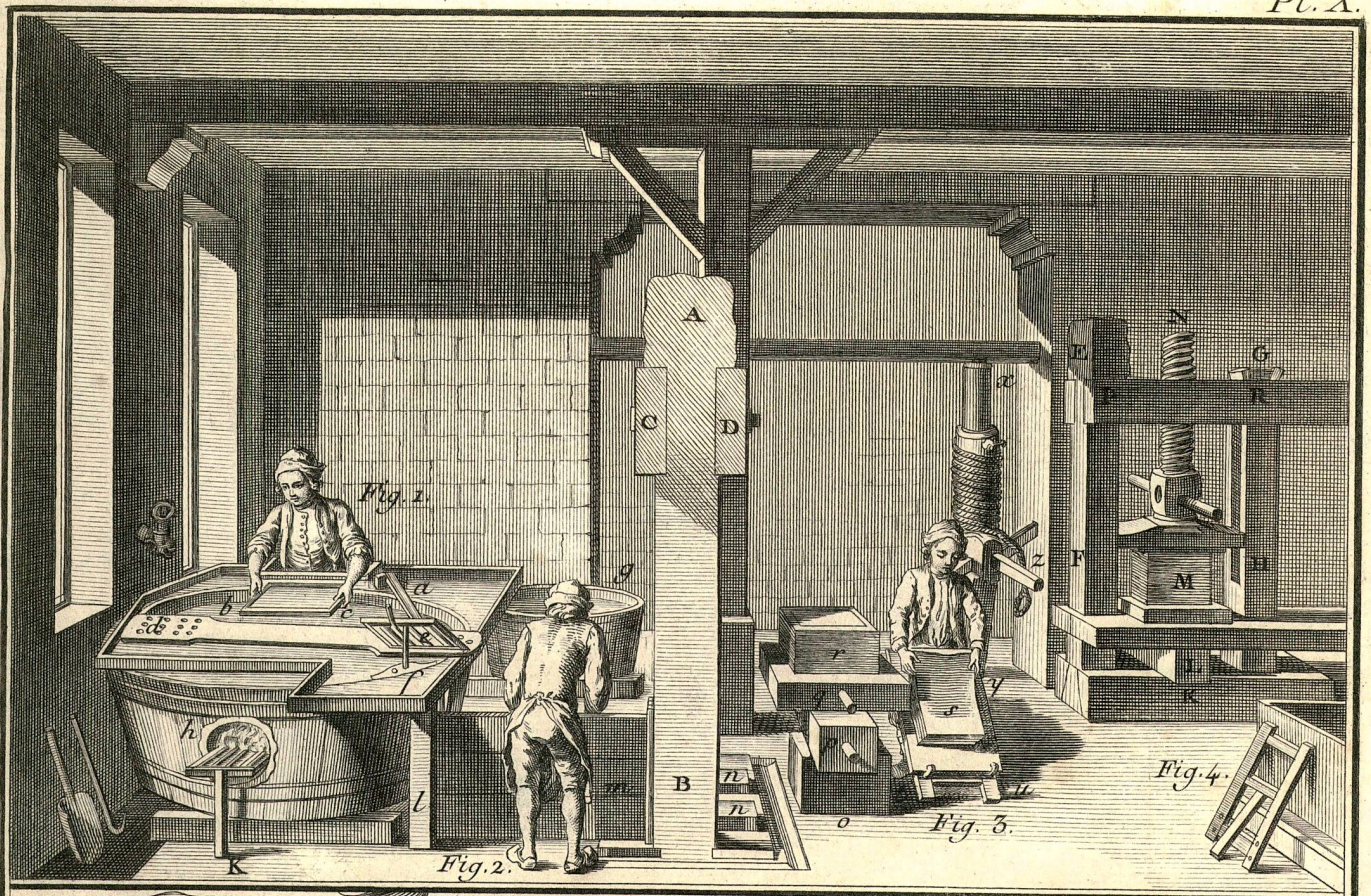

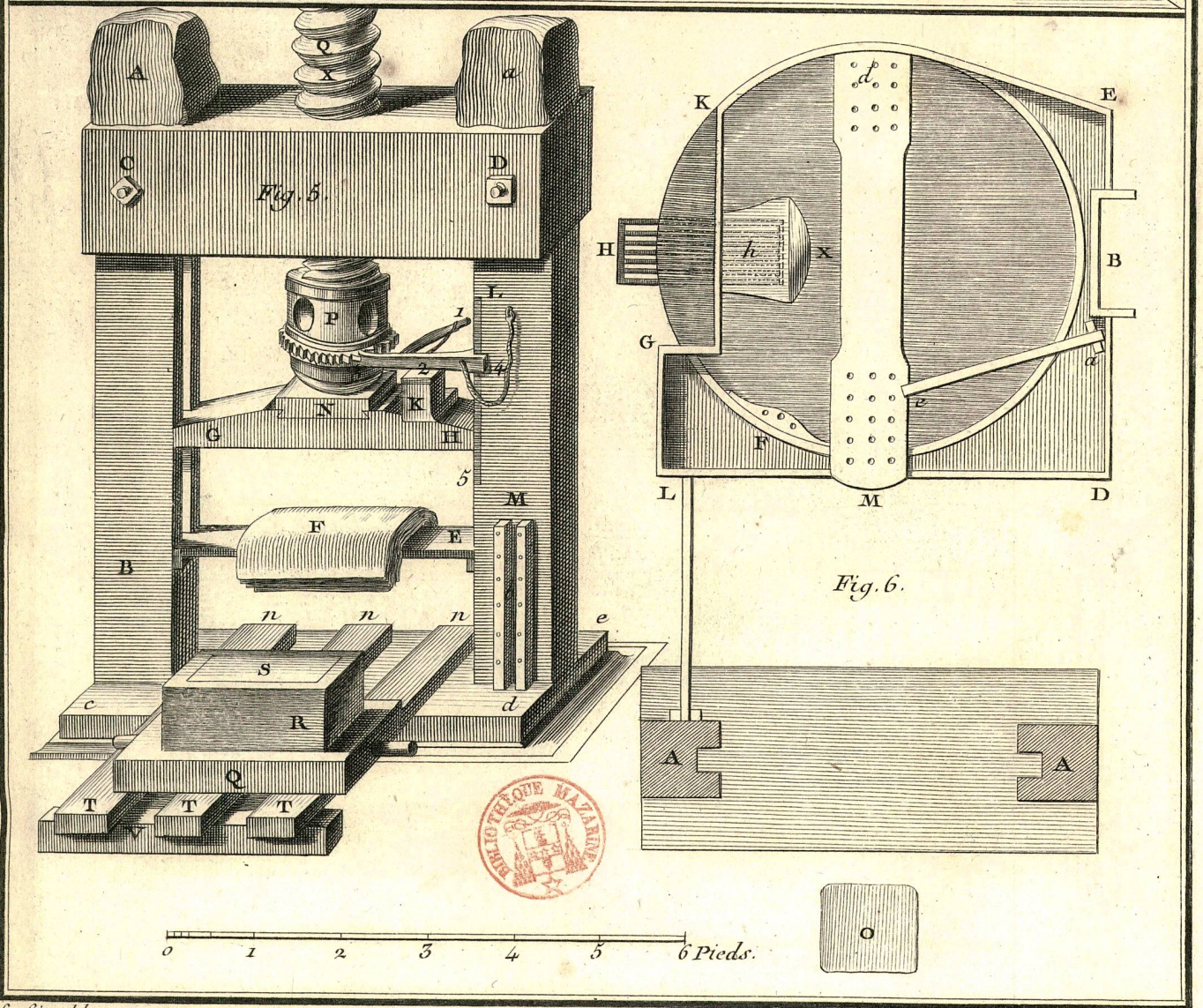

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couldn't depend on the job lasting long. So the paperworker on the tramp made his way by "raising his rent". When he arrived at a mill, he generally received some combination of bread, wine or beer, a place to sleep, and a quire of broken sheets. If he was fortunate, he might get an audition for a place around the vats. Even if nothing came of this chance, an Auvergnat manufacturer complained that he had to let the itinerant "pass and pass and even pass again" through his mill, or watch his own skilled hands depart *en masse*.[16] This wasn't the "propositional knowledge" of Enlightened science, but it was the tacit knowledge that enabled vulnerable journeymen to survive the familiar passages of their trade.

Journeymen paperworkers were well aware that the end of the line came early and often suddenly. At the close of the seventeenth century, rag-collectors caught the eye of the Italian physician Bernardino Ramazzini. As they hauled their "filthy wares" to the paper mills, he wrote, they were tormented by "coughs, asthma, nausea, and vertigo", the same afflictions known to plague paperworkers.[17] Red arms, missing fingernails, and rheumatism were the lot of every vatman and coucher. Stooped backs often hobbled these skilled men, who sometimes switched stations to ease their pain. Ramazzini prescribed vinegar and water for the rag-collectors' ailments. Both the journeymen paperworkers and the millwomen, however, had little respite from the discomforts and toll of their work. (In a rare mention of the distress of labor in a paper mill, the *Encyclopaedia Britannica* observed that the recent invention of the duster, a mechanical device that shook the debris from the rags before they were sorted, rendered this noxious toil "less pernicious to the selectors".)[18] Battered by long hours in the mills and long hours on the road when mills shuttered, only hardy journeymen fashioned paper once they turned forty; indeed, paperworkers above this age had to prove that they had a smooth and steady "vatman's shake".

Proud of their art and gradually enfeebled by it, journeymen paperworkers did everything in their power to make sure that their mastery paid off. To regulate their ceaseless travels on forbidding roads as well as their routine journeys up the craft ladder, they forged local, regional, and national combinations everywhere in Europe. The French Crown deplored a kingdom-wide *association* that rendered journeymen paperworkers the "masters of the success or of the ruin of the entrepreneurs". In fact, one official raged, "this republican *corps*" remained "jealous of a self-styled, chimerical independence".[19] The paperworkers had crafted their own, illicit civic bodies within the broader custom of the trade. Manufacturers who ignored the journeymen's claims found their mills "damned", that is, idled by the departing workers. Worse yet, the mills were surrounded by mountains of rags and stuffed with paper and chemicals: it was the daring master who did not bow to the threat of arson as well as a boycott. "Mindful hands" learned more things by doing than technical expertise, which is why some masters dreamed of fully mechanized papermaking.

Neither master papermakers nor journeymen paperworkers considered themselves to be members of a unified craft community with a single set of interests. But they shared more than the manufacturers' heated comments may suggest. For instance, French masters and men alike knew that wrinkles in the paper were "goat's feet" and uneven swells of pulp were *andouilles*, "sausages", or perhaps turds. This colorful jargon also taught: if pulp puddled along the "mauvaise rue", the side of the mold that lay against the vatman's gut, an experienced coucher warned his companion that the infant sheet was "unrefined (revêche)". Moreover, the masters and men who produced this flawed paper drew on common assumptions about the profitable use of worktime. In 1788, Nicolas Desmarest, a French inspector of manufactures, noted that "clever" producers disdained overtime work.[20] Nevertheless, when orders backed up, enterprising manufacturers acted otherwise (as they always had) and paid the journeymen for "overwork" – and then hid the shoddy sheets fashioned by the fatigued workers in reams of fine paper. (No doubt, the workers were quite skilled in looking the other way, as they were when masters dumped quicklime into discolored pulp to whiten the sheets.)

As the arrangements between masters and men evolved, wages proved considerably less stable than output quotas. As a rule of thumb, the entrepreneurs and the workers were well aware that the reward for a week's worth of a skilled man's toil equaled the price of a single ream of good paper. Small wonder, then, that in early modern European papermaking, both manufacturers and journeymen put a premium on the command of work, its time, and its compensation. The conceptualization of time as money, at least in papermaking, took root long before the mechanization of the art, not as a result of it.

Polish paperworkers and most of their French brothers sweated around the vats for twelve hours each day, six days a week.[21] At the Worblaufen and Zu Thal mills of Berne, where the journeymen evidently began their toil at 3:00 a.m., workdays stretched from twelve to fourteen hours, with some sort of "break" for the vatmen and couchers.[22] Work around the vats in the Austrian Rannersdorf mill regularly lasted for an exhausting fourteen hours.[23] Such comparisons, it must be noted, are less exact than they appear. English paperworkers, for instance, sometimes took an hour and a half break for meals, but they were also known to eat while laboring around the vats. At the Montgolfier mill in Annonay, however, the influential and calculating masters engineered particularly precise workdays punctuated by equally precise mealtimes. The governor of the beaters sounded the bell at 3:45 a.m. and work began at four. The day's labor was divided into four segments, each capped by a meal, and ended at 7:00 p.m. Étienne Montgolfier claimed that the "effective" workday in the family's shops was thirteen hours. Seasonal light mattered little in the mill, since the Montgolfiers joined their Auvergnat *confrères* and ignored the longer summer workdays prescribed by the state in

1739. Just to be sure, the Montgolfiers computed the precise hours of candlelight needed in their mill from mid-August to the end of April; December, for example, required six hours and forty-five minutes worth of candles.[24] They embraced a highly mathematized approach to secure regular diligence and output, but it was less audacious because their production quotas largely conformed to the trade's long-time standards.

If most paperworkers' days were somewhat less mechanical than those endured by the Montgolfiers' hands, their "day's work" was every bit as exact. In Angoumois, Desmarest reported that the everyday workload "always" amounted to twenty posts of paper.[25] This quota was so widely ingrained in the English trade that the Combination Act of 1796, which called into question much of the industry's contested custom, still specified that "twenty of which posts shall and do make a day's work". Over time, the seasoned vatman learned how often *per minute* he had to dip his mold in the pulp to build a proper post. This became an intense, familiar time-discipline. Thus the Combination Act mandated that "the time of working by journeymen at the vat shall be half an hour about each post".[26] The Montgolfiers' hands even launched a complaint by indicating themselves precisely how much time it took to produce a post.[27] Perhaps masters once had to impose the "day's work" of twenty posts on recalcitrant journeymen; but by the eighteenth century, paperworkers in England, France, and the German states had internalized this figure. The everyday mathematization of the killing work of hand papermaking and its disciplinary demands had taken shape within a fabric of immemorial, customary measures. It was the absence of an industrious revolution in papermaking and the modest contribution of Enlightened science to the art that framed its mechanization.

None of the eighteenth-century encyclopedists called for the full mechanization of papermaking. Perhaps they were incapable of imagining such a transformation, although Joseph Montgolfier, the famed balloonist, experimented with wooden automata that mimicked the vat crew. His effort failed, and so enterprising manufacturers were left, at most, with Josiah Wedgwood's vision of making "such *machines* of the *Men* as cannot Err".[28] But journeymen paperworkers resisted becoming automata. So Nicolas-Louis Robert, an "inspector of personnel" at the Langlée mill in France, set out to create a machine to replace them; the prototype received a patent from the French state in 1799. As Robert's former employer, Saint-Léger Didot, explained, he had not crafted the device solely, or even primarily, to increase output. "Disgusted, like me, by the bad conduct of the *corporation* of paperworkers", Didot concluded, Robert had decided "to seek the means of fabricating paper without their aid".[29] His invention, which centered on a ceaseless, rotating web of wire mesh slathered with pulp, was yet another mechanical mimic of the journeymen's skills. Within a decade of Robert's patent, Bryan Donkin, an imaginative English engineer and tinkerer, had created a commercially viable papermaking machine.

Robert had reversed Wedgwood's formula: he made a machine that embodied the actions of men. In doing so, he had also reconfigured the familiar balance of power in the industry. In 1837, an English producer testified that traditional paper manufacturers "were very much at the mercy of the men".[30] But in 1853, a beleaguered English master papermaker, still clinging to his vat, observed that the contest of his day wasn't "Men *versus* Masters, but it is Men *versus* Machines".[31] The lived terms of the paperworkers' experience had been as tightly wrapped as the work of the vat crew. The papermaking machine drew on and unraveled this enduring web of skilled toil, custom, compensation, worktime, and shop floor relationships. Whether the "factory artisans" in shipyards, glassworks, and silk mills shared elements of the paperworkers' transitions remains to be seen. ■

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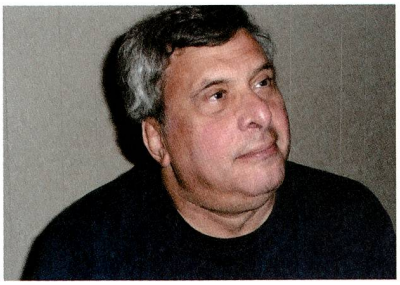

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Annotations

1 Bruce Laurie, Artisans Into Workers. Labor in Nineteenth-Century America, New York 1989.

2 E. P. Thompson, Customs in Common. Studies in Traditional Popular Culture, New York 1991, p. 185–351; Jan de Vries, The Industrious Revolution. Consumer Behavior and the Household Economy, 1650 to the Present, Cambridge 2008, p. 1–185.

3 On expertise, see Eric Ash (ed.), Expertise. Practical Knowledge and the Early Modern State, Chicago 2010; on learning by doing, see Bert de Munck, Steven L. Kaplan, and Hugo Soly (eds.), Learning on the Shop Floor. Historical Perspectives on Apprenticeship, New York 2007; on the mindful hand, see Lissa Roberts, Simon Schaffer, and Peter Dear (eds.), The Mindful Hand. Inquiry and Invention from the Late Renaissance to Early Industrialization, Amsterdam 2007; on trading zones, see Pamela O. Long, Artisan/Practitioners and the Rise of the New Sciences, 1400–1600, Corvallis, OR 2012. For the genesis of the concept of trading zones, see Peter Galison, Image and Logic. A Material Culture of Microphysics, Chicago 1997.

4 De Vries (see n. 2), p. 1–185.

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6 On the industrial Enlightenment, see Joel Mokyr, The Enlightened Economy. An Economic History of Britain, 1700–1850, New Haven, CT 2009. The quoted passages appear on p. 60.

7 D. C. Coleman, The British Paper Industry, 1495–1860. A Study in Industrial Growth, Oxford 1958, p. 169.

8 Johann Lindt, The Paper-Mills of Berne and Their Watermarks, 1465–1859, Hilversum 1964, p. 49, Table (Prices of Rags, Paper, and Wages at the Worblaufen and Zu Thal Mills during the Eighteenth and Nineteenth Centuries), double-starred note.

9 Quoted in Leonard N. Rosenband, Papermaking in Eighteenth-Century France. Management, Labor, and Revolution at the Montgolfier Mill, 1761–1805, Baltimore, MD 2000, p. 53.

10 Quoted in E. J. Labarre, Dictionary and Encyclopaedia of Paper and Paper-Making, Amsterdam 1952 [2d ed. revised and enlarged], p. 41.

11 Quoted in Malcolm Chase, Early Trade Unionism. Fraternity, Skill, and the Politics of Labour, Aldershot 2000, p. 114.

12 Rosenband (see n. 9), p. 97.

13 Quoted in ibid., p. 54

14 Quoted in Coleman (see n. 7), p. 273.

15 Quoted in ibid., p. 272.

16 Quoted in Rosenband (see n. 9), p. 57.

17 Bernardino Ramazzini, Diseases of Workers, trans. Wilmer Cave Wright, Chicago 1940 [1713, 2d enlarged ed.], p. 291. The first edition of Ramazzini, De Morbis Artificum, was published in Modena in 1700. Wright "revised" Ramazzini's text and added "notes", but the present author cannot evaluate her efforts.

18 Encyclopaedia Britannica, Edinburgh 1797 [3d ed.], p. 709.

19 Quoted in Rosenband (see n. 9), p. 59–60.

20 Nicolas Desmarest, Papier. Art de faire le, in Encyclopédie méthodique. Arts et métiers mécaniques, Paris 1788, vol. 5, p. 510.

21 Oriol Valls I Subirà, The History of Paper in Spain, XVII–XIX Centuries, Madrid 1982, vol. 3. Valls I Subirà explained that "the work day in France was twelve hours", and observed that the same regimen characterized papermaking in "Italy, Poland and England", p. 17. Without explanation, he wrote that in Spanish papermaking "there were no set working hours. If meeting a delivery date for an order of paper involved around-the-clock hours, the mill remained working day and night", p. 15.

22 Lindt (see n. 8), p. 49, Table, starred note. On the "break", see p. 56.

23 Georg Eineder, The Ancient Paper-Mills of the Former Austro-Hungarian Empire and Their Watermarks, Hilversum 1960, p. 52.

24 Rosenband (see n. 9), p. 71.

25 Desmarest (see n. 20), p. 510.

26 The Statutes at Large, 36 George III, c.111, vol. XL, 814.

27 Document 39, Archives Nationales, 131 MI 53 AQ 23.

28 Quoted in Neil McKendrick, Josiah Wedgwood and Factory Discipline, in: Historical Journal 4 (1961), p. 34.

29 Quoted in Henri Gachet, Les Grèves d'ouvriers papetiers en France au XVIIIème siècle jusqu'à la Révolution, in: Papers of the Twelfth International Congress of the International Association of Paper Historians, Haarlem 1972, p. 140.

30 Quoted in Coleman (see n. 7), p. 258.

31 Proceedings at a Meeting of the Vat Paper Makers held at The Bell Hotel, Maidstone on Tuesday 8th March 1853, p. 5. Facsimile in the author's possession.

Picture credits

1 [Encyclopédie, ou Dictionnaire raisonné des sciences, des arts et des métiers] Recueil de planches sur les sciences, les arts libéraux, et les arts méchaniques, avec leur explication, Quatrième livraison, 248 planches. - À Paris : chez Briasson : David : Le Breton, 1767, Bibliothèque Mazarine, 2° 3442 Volume 26, https://mazarinum.bibliotheque-mazarine.fr/ark:/61562/mz2137 / Creative Commons CC BY-NC-ND 3.