

Society and Technological Change

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Rudi Volti
Pitzer College

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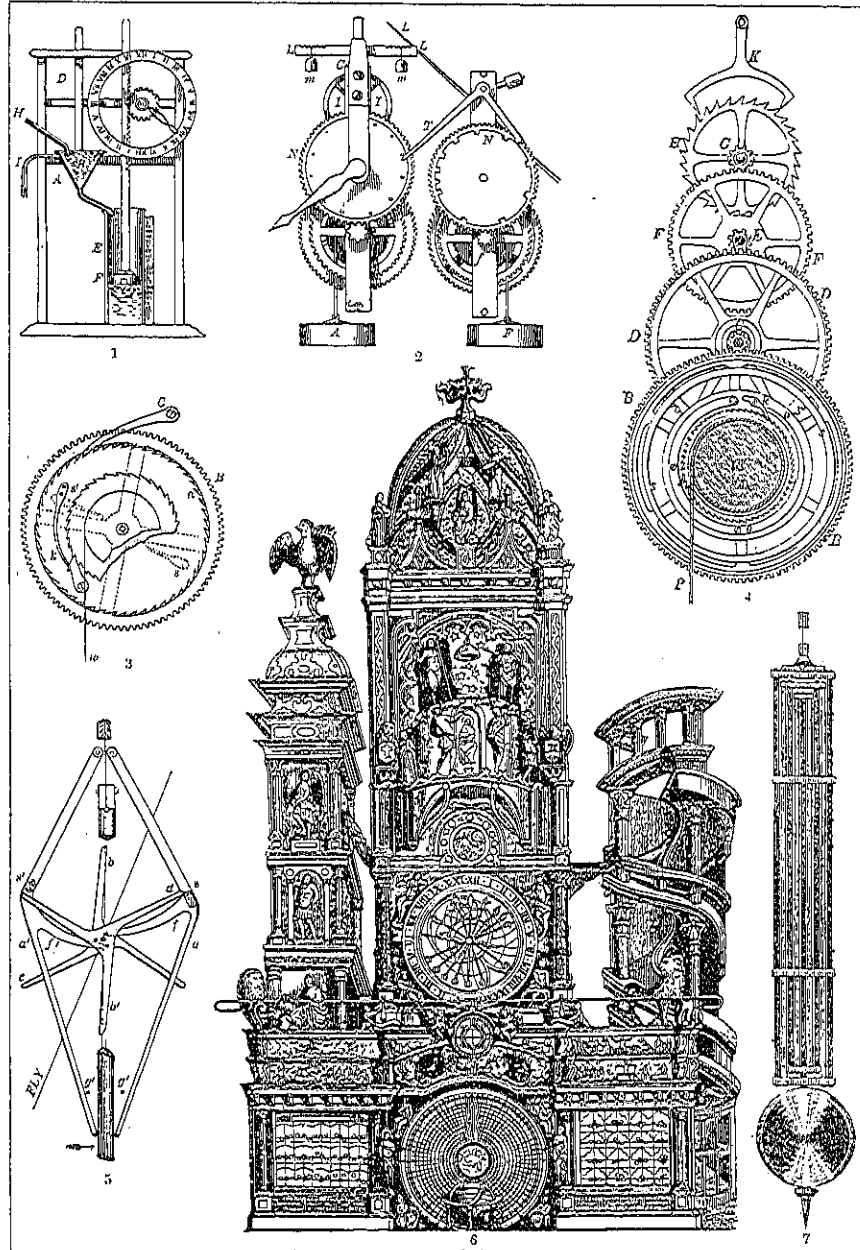
The Clock

Important as these changed attitudes might have been, "modern" attitudes toward work, especially the way it was organized and scheduled, also were influenced by a key invention that allowed the precise scheduling of work activities: the clock. To be sure, methods of telling time had existed throughout the ancient world. Sundials, candles with marked segments, and vessels that discharged water at a regular rate were all employed in antiquity. But each had drawbacks: sundials were useless at night and on cloudy days, candles could blow out, and water clocks froze in the wintertime. Equally important, most work activities in the ancient world required little in the way of precise timing and scheduling. These requirements arose only in conjunction with a new kind of social organization: the medieval monastery.³⁸ By the standards of their day, these monasteries were very large enterprises, many of them containing hundreds of monks and other workers. Their cooperative efforts required precise scheduling, as did their patterns of religious observance, which required regular times for prayers, masses, and other religious observances. This was most pronounced in the monasteries following the Rule of St. Benedict, which divided days and nights into intervals of twelve hours each and required prayers to be said at sunrise, at the third hour of daylight, at noon, at the ninth hour of daylight, and at sunset.³⁹

The first clocks were built in the thirteenth century, their construction motivated by a growing awareness of the value of accurate timekeeping.⁴⁰ The scheduling of activities through the use of special timepieces had brought economic benefits to the monasteries and secular enterprises, and over time the idea of orderly routines and schedules had become an integral part of city life in late medieval Europe. There is the example of Philip VI of France giving to the city of Amiens in the fourteenth century a charter that allowed the issuance of an ordinance "concerning the time when the workers of the said city and its suburbs should go each morning to work, when they should eat and when to return to work after eating; and also, in the evening, when they should quit work for the day; and that by the issuance of said ordinance, they might ring a bell which has been installed in the Belfry of said city, which differs from the other bells."⁴¹ It was in these urban centers during the early fourteenth century that the mechanical clock began to exert its influence. The ringing of the town bell could be specifically tied to the needs of emerging occupations, as when the governor of the county of Artois granted to the government of the city of the same name the right to construct a special belfry because of the "cloth trade and other trades which require several workers each day to go and come to work at certain hours."⁴²

In addition to laying the foundation for a more regularized pattern of work, the clock embodied all of the key characteristics of a machine. It used an external source of energy (a spring or a falling weight), unlike traditional tools and devices that required human or animal muscle power. The even distribution of this energy required some sort of regulator, as typified by the pendulum discovered by Galileo,

and first brought to practical application in Holland. The clock's operation was automatic, requiring little human intervention. Finally, the clock put out a standard "product"—hours, minutes, and seconds.⁴³



MEASUREMENT OF TIME.—1, Egyptian clepsydra (200 B. C.). 2, Turret-clock of Heinrich von Wick, or De Vick (A. D. 1370). 3, Harrison's maintaining power as attached to weight-clocks. 4, Train of a pendulum-clock. 5, Denison's double three-legged gravity escapement. 6, Great clock of the Strasburg Cathedral. 7, Compensated clock-pendulum.

Early timekeeping devices. (Culver Pictures, Inc.)

In producing this standard product, the clock had made time into a kind of substance. Without getting into deep philosophical waters, we can assert that time as we tend to think of it does not exist; when we think or speak about time what we are actually dealing with are *measures* of time: seconds, hours, decades, or centuries. These units of time are then taken to have real substance, and are treated as valuable commodities. Hence, we use phrases like "saving time," "wasting time," "spending time," and "buying time." Note too the commonly heard assertion that "time is money."

The conversion of time into a commodity reinforces the rational spirit that was briefly described in Chapter 1. It stimulates the conscious choice of specific means for the attainment of given ends, and provides a basis for judging the worth of a particular activity relative to others. Individuals in a society obsessed with time find it difficult to go about their work in an unplanned and irregular fashion.

The precise scheduling of work received further emphasis as new mechanical technologies began to make their appearance. Spinning jennies, power looms, flour mills, and refractory furnaces, as well as the water wheels and steam engines that ran them, called for a mechanically paced way of working that was profoundly different from the old ways of doing things. The process that began with medieval monasteries and thirteenth-century clocks moved inexorably toward the conversion of most work into routinized procedures governed by artificial time schedules. In Chapter 10 we will look at these historical developments and attempt to bring them up to date. But before analyzing the effects of technological development on the quality of work today, we will examine an issue even more fundamental: the prospect that technological advance might leave many people with no work to do.