



Observations made by Mr. Wolle, March 11, 1899, on John Haplin and Joseph Yamish in loading full pigs (average weight 92 lbs.) on B. & Q. car # 54285, together with 10 other laborers from Hack's Gang. The full load of 57680 lbs. was loaded in 54 minutes, which represents very slow work, the men crowding each other too much to do their best. The weather was cloudy, with a temperature of about 55°.

TABLE NUMBER ONE

Condition of work	Average walk on level 5 feet.			Walk on plank 18 feet with 5 ft. rise.			Top of car 2 ft. 6 in. above top of plank.											
	Max. time in min.	Min time in min.	Average time of 15 observations.	Max. time in min.	Min time in min.	Average time of 15 observations.	Max. time in min.	Min time in min.	Average time of 15 observations.									
	Operation #1. Picking up pig.			Operation #2. Walking to car with pig.			Operation #3. Throwing pig into car.			Operation #4. Walk back empty.			Operations 2&3 observed together.			Operations 1,2,3&4 observed together.		
Haplin	0.50	0.15	0.316				0.35	0.18	0.258	0.30	0.17	0.226						
Yamish	0.25	0.05	0.101				0.12	0.08	0.093	0.17	.05	.108						

EXHIBIT 3

What Price Productivity?

In the late 1800s, engineer Frederick Winslow Taylor pioneered his revolutionary time-motion studies. Taylor brought his stopwatch to the shop floor, where he logged workers' every movement to scrutinize, shortcut and speed up. Taylor's methods raised productivity and hastened the move to mass production, but not—many thought—without cost in terms of working conditions. Such classic films as Fritz Lang's *Metropolis* projected the foreboding future Industrial Age workers foresaw as human automatons. Cold-blooded corporations, seeking ever-greater productivity, would consign workers to mind- and body-numbing repetitive-motion jobs, in which every day was worse than the one before. At least, that was the fear. But was it the reality? Hardly.

Since the creation of the first assembly line, with all its associated humdrum, the invisible hand of free markets has generated new and better jobs for manual workers, replacing repetitive jobs with professional and technical careers and creative pursuits. During the half century from 1900 to 1950, the fraction of American workers employed in nonfarm manual jobs rose from 36

percent to 41 percent. The economy busily shed even more agricultural laborers, though, cutting them from 38 percent to 12 percent. And since 1950 there has been a steady downward trend in nonfarm manual jobs, which fell to 25 percent of total U.S. employment in 2000. Farm jobs fell to 2.5 percent. The share of jobs held by managers and professionals rose from 10 percent to 30 percent over the century, and those held by technical workers, salespeople and administrative support staff went up from 7.5 percent to 29 percent.

Of course, some monotonous and tiresome jobs—such as assembler and machine operator—will always exist. Punching, stamping, slicing, cutting, sawing, sewing, grinding, polishing—a selected 3 million machine operators make up just 2.2 percent of the employed labor force today but account for more than 14 percent of all repetitive-motion injuries. Assemblers make up just 1.2 percent of the labor force but account for 11 percent of all such injuries. The mere fact these jobs aren't popular tends, in the long run, to be the source of their undoing. Over just the past three decades, the fraction of Americans employed in the 20 jobs most prone to repetitive-motion injury has fallen by almost two-fifths—from 11.3 percent to 6.9 percent.



This flywheel assembly process at a Ford plant, circa 1913, was typical of the kind of repetitive task that defined the early Industrial Age.

Repetitive Motion: The Tiresome 20

	Incidence Rate	Percentage of U.S. Employment	
		1970	2000
1 Production testers	7.134	.08	.05
2 Assemblers	4.885	1.28	1.21
3 Upholsterers	3.950	.08	.05
4 Selected machine operators	3.527	3.67	2.19
5 Hand packers and packagers	3.417	.72	.27
6 Textile machine operators	3.376	1.14	.31
7 Production helpers	2.950	.18	.06
8 Machine feeders and off-bearers	2.855	.14	.06
9 Crane and tower operators	2.671	.17	.05
10 Nonconstruction laborers	2.618	1.19	.97
11 Butchers and meat cutters	2.453	.36	.20
12 Taxicab drivers and chauffeurs	2.306	.21	.21
13 Order clerks	2.251	.13	.23
14 Welders and cutters	2.236	.72	.44
15 Telephone operators	2.173	.50	.12
16 Kitchen workers	2.162	.09	.23
17 Driver/sales workers	2.140	.36	.12
18 Farm product graders and sorters	2.131	.03	.05
19 Furnace, oven and kiln operators	2.052	.23	.04
20 Miscellaneous handworkers	1.777	.02	.07
Average incidence rate (worst 20)	3.377		
Total employment shares		11.30	6.93
Average incidence rate (all jobs)	.580		
Incidence rates are per 1,000 employees.			