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Hamilton Steelworkers and the Rise of Mass Production

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Article abstract

C'est en deux phases bien distinctes que le capitalisme industriel fut instauré au Canada, à l'instar d'ailleurs de ce qu'il appert pour les autres pays occidentaux. La « première révolution industrielle » — comme on s'est plu à l'appeler — s'est manifestée au pays vers les années 1850 et I860 et elle s'est épanouie « en serre chaude » dans les années 1880 à cause de la Politique Nationale qui avait cours à l'époque. La « seconde révolution industrielle » s'amorça au début du XX^{e} siècle et résultait d'une économie capitaliste beaucoup plus sophistiquée où se côtoyaient une technologie et des moyens de production nouveaux et complexes de même que des géants corporatifs dans les domaines de l'acier, de l'automobile, du papier et des produits chimiques, pour n'en mentionner que quelques-uns.

Bien que cette deuxième phase du capitalisme industriel ait considérablement affecté les conditions de travail de milliers d'hommes et de femmes au Canada, l'historiographie récente, pourtant abondante dans le domaine de l'histoire des travailleurs, a pratiquement ignoré le phénomène de la fabrication en grande série qui caractérisa cette deuxième phase. C'est une partie de cette histoire que l'auteur retrace ici par le biais d'une étude sur l'industrie sidérurgique à Hamilton, Ontario, un des trois grands centres de cette industrie au Canada. Il y examine l'essor de la Sleel Company of Canada et de ses prédécesseurs entre 1895 et 1930, les transformations que subirent les méthodes de travail dans le domaine de la sidérurgie à l'époque et les relations de travail qui se développèrent au sein de cette corporation dans ses usines de Hamilton.

*Hamilton Steelworkers and the Rise of Mass Production**

CRAIG HERON

Industrial capitalism came to Canada, as it did to most western nations, in two distinct phases. The so-called "First" Industrial Revolution, based on coal, iron, steam, and for the most part, relatively simple technology, took root in Canada in the 1850s and 1860s and blossomed in the National Policy hot-house of the 1880s.[1] The momentum for the "Second" Industrial Revolution, which took off at the close of the nineteenth century within the emergent monopoly capitalist economy, came from the complex new technology and production processes of corporate giants in steel, auto, chemicals, pulp and paper, electrical goods, meat packing, and so on. Although this second phase of industrial development in Canada ushered in a vastly different work environment for thousands of Canadian men and women, the recent boom in the writing of working-class history has virtually ignored the rise of mass production.[2] This paper attempts to tell the part of that story which unfolded in one of Canada's three leading steel-producing centres, Hamilton, Ontario. It will consider the growth of the Steel

* I am grateful to the Social Sciences and Humanities Research Council for financial support during the researching and writing of this paper and to the Labour Studies Research Group for critical comments.

1. See H. Clare Pentland, *Labour and Capital in Canada, 1650-1860* (Toronto, 1981), pp. 130-75; Thomas William Acheson, "The Social Origins of Canadian Industrialism: A Study of the Structure of Entrepreneurship", (Ph.D. thesis, University of Toronto, 1971); Jean Hamelin and Yves Roby, *Histoire économique du Québec, 1851-1896* (Montreal, 1971); Gregory S. Kealey, *Toronto Workers Respond to Industrial Capitalism, 1867-1892* (Toronto, 1980), pp. 3-34; Bryan D. Palmer, *A Culture in Conflict: Skilled Workers and Industrial Capitalism in Hamilton, Ontario, 1860-1914* (Toronto, 1979), pp. 3-31; Leo A. Johnson, *History of the County of Ontario, 1615-1875* (Whitby, 1973); L.D. McCann, "The Mercantile-Industrial Transition in the Metal Towns of Pictou Country, 1860-1931", *Acadensis*, X, no. 2 (Spring 1981), pp. 29-64; Robert Babcock, "Economic Development in Portland (Me.) and Saint John (N.B.) during the Age of Iron and Steam, 1860-1914", *American Review of Canadian Studies*, IX, no. 1 (Spring 1979), pp. 1-37; Ian McKay, "Capital and Labour in the Halifax Baking and Confectionery Industry During the Last Half of the Nineteenth Century", *Labour/Le Travailleur*, III (1978), pp. 63-108.
2. Wayne Roberts' doctoral thesis remains one of the few Canadian studies which attempts to take account of mass-production work processes; see "Studies in the Toronto Labour Movement, 1896-1914", (Ph.D. thesis, University of Toronto, 1978). On the general phenomenon of the "Second" Industrial Revolution, see David Landes, *The Unbound Prometheus: Technological Change and Industrial Development in Western Europe from 1750 to the Present* (Cambridge, 1972).

Company of Canada and its predecessors between 1895 and 1930 and the transformation of work processes and work relations within that corporation's plants in Hamilton.

It was the decade before World War I which brought the first major managerial innovations in the steel industry — new machines, new industrial recruits, and new labour policies — to create the now familiar world of high-speed mass production. The workers drawn into this new factory environment initially tended to pass through it quickly, enduring the harsh, unfamiliar work routines only long enough to earn some ready cash. Gradually, however, this "floating" labour force developed some experience with this kind of industry, as well as an increasing commitment to their jobs that would encourage them to challenge the company's employment policies. A series of sporadic revolts before the war evolved into the first effort to organize an industry-wide union in 1919-20. This first experiment in industrial unionism raised the human concerns which were being ignored in the new industry, but did not succeed in shaking the steelmasters' firm control over their production processes. The steelworkers' ultimate failure to reshape their work environment will help us appreciate some of the difficulties facing Canada's first generation of mass-production workers in coping with the great industrial transformations of their age.

I

The Canadian steel industry[3] was a late bloomer compared with the extensive iron and steel works of British and American firms in the late nineteenth century. Although Britain's C.W. Siemens conducted some unsuccessful experiments in open-hearth steel production at Londonderry, N.S., in the 1870s, and Canada's first steel ingot was poured at Trenton, N.S., in 1883, large-scale production of iron and steel did not begin in Canada until the late 1890s. The country's would-be steelmakers had always faced both a dearth of high-quality raw materials (except for Nova Scotia coal) and the intense competition of British and American producers whose large markets had permitted economies of scale and expensive technological innovation. The Canadian tariff structure, moreover, contained huge loopholes which favoured the consumers of primary iron and steel products (foundries, rolling mills, agricultural implement works, and the like) at the expense of the primary producers, by allowing many of these products to be imported duty free. A system of federal and provincial bounties to

3. The "steel industry" here includes three stages of productive activity, which by the early 20th century were most often carried on within one corporate structure: in the *blast furnace*, iron ore was melted down, along with coke and limestone, to remove impurities and produce pig iron; in the *open-hearth* steel plant, molten pig iron was subjected to intense heat and small quantities of ferro-alloys were added to produce steel, which was then poured into ingot moulds (the other, less common process of producing steel, by the Bessemer converter was never used in Hamilton); in the *rolling-mill* plants or departments the steel ingots were passed between various sets of rolls to produce a variety of shapes and steel products, from channel iron to fence wire.

Canadian iron and steel makers expired in 1910 having had only a meager protective effect on the primary industry.[4]

In this constrained context the Canadian steel industry which emerged at the turn of the century developed along two different lines. The more spectacular enterprises, at Sydney and Sault Ste. Marie, were bold entrepreneurial initiatives which grew out of major mining and hydro-electric projects. In these cities Dominion Iron and Steel and Algoma Steel constructed large-scale, specialized facilities in the hopes of seizing the apparently insatiable market for railway supplies, especially rails. After shaky starts in both cases, this path led first to remarkable success in the pre-war years, but then to disaster in the 1920s once the great surge of railway construction had ended. The other development strategy among Canadian steelmakers was slower, more prudent expansion based on the diversified needs of many different metal-working and transportation industries. Nova Scotia Steel had pioneered this strategy at Trenton in the 1880s, and in 1895 a group of Hamilton businessmen launched a similarly modest effort on the shore of Burlington Bay.

An exuberant crowd of several hundred visitors cheered the lighting ("blowing in") of the new furnace of the Hamilton Blast Furnace Company on 30 December 1895, and production of pig iron began within a few weeks. In 1899, as part of the trend toward integration of all the stages of iron and steel production within a single firm, the company amalgamated with a twenty-year old Hamilton enterprise, the Ontario Rolling Mills Company. The next year the new company, now known as the Hamilton Steel and Iron Company, opened a small steel plant.

Over the next decade expansion was cautious; as a company executive recalled, "so limited was the market at this time that it was found impossible to keep both [open-hearth] furnaces running continuously. Even one furnace running at its capacity for over a month made more steel than could be sold." Two more open-hearth furnaces and facilities to produce railway spikes were eventually added, and in 1907 a second blast furnace, but the firm's great leap forward came in 1910. That year the Hamilton Steel and Iron Company merged with the local Canada Screw Company and a string of iron and steel finishing plants in Montreal, Belleville, Gananoque, Swansea, and Brantford. The new corporation, the Steel Company of Canada, included facilities to produce a wide range of metal products — screws, nuts and bolts, wire, nails, pipes, and much more — and in order to supply these plants with steel, a massive expansion of the corporation's production facilities in Hamilton followed the merger: two new open-hearth furnaces and large new rolling mills capable of

4. The history of the Canadian iron and steel industry can be found in W.J.A. Donald, *The Canadian Iron and Steel Industry: A Study in the Economic History of a Protected Industry* (Boston, 1915); Edward J. McCracken, "The Steel Industry of Nova Scotia", (M.A. thesis, McGill University, 1932); Donald Eldon, "American Influence in the Canadian Iron and Steel Industry" (Ph.D. thesis, Harvard University, 1952); William Kilbourn, *The Elements Combined: A History of the Steel Company of Canada* (Toronto, 1960); Duncan L. McDowall, "Steel at the Sault: Sir James Dunn and the Algoma Steel Corporation, 1906-1956", (Ph.D. thesis, Carleton University, 1978); McCann, "Mercantile-Industrial Transition"; Tom Traves, *The State and Enterprise: Canadian Manufacturers and the Federal Government, 1917-1931* (Toronto, 1979), pp. 121-54.

producing blooms, billets, rods, and bars. The demand for munitions in World War I brought a further increase in capacity and the addition of by-product coke ovens and a mill for the production of sheet metal, as well as vertical integration into iron-ore and coal-mining operations in the United States. By the 1920s the Steel Company's strategy of relying on diversified markets and its central location in the heartland of Canadian manufacturing had brought the corporation to a leadership role in the country's steel industry, surpassing its crisis-ridden competitors in Sault Ste. Marie and Sydney.[5]

The Hamilton iron and steel complex emerged later and more cautiously than its principal counterparts in the United States, but, like all other Canadian firms, its production processes were nonetheless modelled on American practices. The inventive American steelmakers were producing the world's cheapest steel by the 1890s,[6] and, in order to survive in the face of this competition with minimal tariff protection, Hamilton's steel men had to match the American standards of efficiency. When a careful eye was therefore trained on production costs, the cost of labour inevitably received particular attention. Increased productivity would necessitate speeding up production, increasing output, and securing more predictability within a large, integrated corporation.

What were the labour requirements of iron and steel production at the end of the nineteenth century? By the time the first ingot was cooling in Hamilton's steel plant in 1900, the role of the craftsmen in the industry had largely been undermined. The Bessemer converter and later the open-hearth furnace had been introduced into the American industry over the previous three decades in order to get around the slow, independent routines of the iron puddler, who had combined muscular prowess and an unschooled knowledge of metallurgical science to transform pig iron into wrought iron. The Ontario Rolling Mills and, for a time, the Hamilton Blast Furnace Company employed a few puddlers, but by the turn of the century the market for this metal was dwindling and Hamilton's puddling furnaces were idle after 1907.[7] Aside from a small number of specialized workmen not directly involved in iron and steel production – moulders, machinists, carpenters, steamfitters, operating engineers, and so on – the only other significant group of operatives with some valuable skills were the heaters and rollers in the rolling-mill plants, the men who manipulated the steel ingots through each set of rolls.[8] The general decline of the skilled workingman in the American industry had been registered by the crushing of his craft union, the Amalgamated

5. *Spectator* (Hamilton), 31 December 1895; W.A. Child, "Iron Trade Built By Determined Men", *ibid.*, 15 July 1926; Kilbourn, *Elements Combined*.

6. William T. Hogan, *Economic History of the Iron and Steel Industry in the United States* (Lexington, Mass., 1971), vol. 1, pp. 343-57; David Brody, *Steelworkers in America: The Nonunion Era* (New York, 1960), pp. 1-26.

7. James. J. Davis, *The Iron Puddler: My Life in the Rolling Mills and What Came of It* (Indianapolis, 1922), pp. 85-113; *Iron Age* (New York), 4 July 1895, p. 25; 30 April 1899, p. 29; 5 April 1900, p. 11; Canada, Department of Trade and Commerce, *Report* (Ottawa), 1908, Part I, pp. 796-97. The first serious student of the Canadian steel industry, W.J.A. Donald, noted just before World War I: "Wrought iron and puddled bars have practically passed from the iron and steel vocabulary." *Canadian Iron and Steel Industry*, p. 242.

8. Child, "Iron Trade"; Hogan, *Iron and Steel Industry*, pp. 38-50; John A. Fitch, *The Steel Workers* (New York, 1910), pp. 45-56.

Association of Iron and Steel Workers, first at Homestead, Pa., in 1892, and then throughout most of the United States Steel Corporation's operations in 1901. A Hamilton lodge of the association had been defeated by the Ontario Rolling Mills management in the 1880s, and this craft union did not revive in the city before World War I.[9] The Hamilton steelmasters would therefore face few problems with independent-minded craftsmen defending their traditional modes of work.

Iron and steel production did, however, continue to rely on large numbers of unskilled labourers for some of the hottest, heaviest, dirtiest, least appealing jobs available to any worker. In 1926 W.A. Child, an executive of the Ontario Rolling Mills in its early days, recalled the use of brute labour for the countless tasks of handling materials, whether lifting, carrying, pushing, hauling, loading and unloading, or maneuvering the ubiquitous wheelbarrow:

> It is a singular fact that in the industries of that day almost no labor-saving machinery was used. All the lifting was done directly by hand labor and so cheap was this labor that it was really more economical to employ direct human effort than machinery. Even cranes, derricks, tackle and all the various simple labor-saving devices were rarely used in any factories at that time....

Years later an elderly Hamilton steelworker remembered that "There wasn't one derrick on the property when I started in 1905."[10] The Hamilton iron and steel plants would still need the brawn of unskilled labourers well into the early 1900s.

Faced with these labour requirements and the intense competition in the market for their products, Hamilton's steelmasters gradually initiated managerial policies which would alter the work routines around their plants. Probably the most striking change was the substitution of machines for men wherever possible — a process which gave the industry the characteristic shape we have come to know as "mass production." Skilled workers, of course, normally exercised a degree of independence on the job which often irked company supervisors, but even the labourers presented annoying problems for corporate planners. Not only, as we will see, were they surprisingly prone to striking and raising the spectre of higher labour costs, but they provided an element of unpredictability in the work process, by slowing down according to the dictates of human endurance or quitting frequently. "Workmen find it bad enough to be forced to handle frozen pig and scrap iron in winter," the *Canadian Foundryman* lamented, "but when the summer heat comes beating down the men become inefficient and discontented. Many of them leave." In fact, North America's unskilled work force in the early twentieth century was a footloose lot. In 1907 the Hamilton *Times* described "a large roving element in the labor market" which was disturbing employers:

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9. Brody, *Steelworkers*, pp. 50-79; Palmer, *Culture in Conflict*, pp. 83-85. In 1899 the AFL's local organizer, John Flett, claimed to have organized the city's rolling mill hands, but, if he did, the local must have died soon afterward. Many of the Hamilton Steel and Iron Company's new steel plant employees apparently came from the United States with union experience, but no lodge was formed in these early years. The company nonetheless agreed to pay them according to the Amalgamated wage scale. *Labour Gazette* (hereafter *LG*), I, no. 9 (May 1901), p. 471.
10. Child, "Iron Trade"; *Stelco Flashes*, XIV, no. 6 (June 1950), p. 7.

> They complain that there is a considerable element of a floating nature, composed in part of foreigners and in part of young men from the country, who come to the city as soon as the fall work is over and expect to go back when spring plowing begins. A majority of men in both of these classes, they say, are none too anxious to take steady jobs. They prefer to put in a week or two here and a week or two there, moving from place to place and earning only enough to keep them over the winter and enable them to have a pretty good time. They are not the class that the manufacturers want, because men coming and going upset organization in the shops and have an unsettling effect upon the regular hands.

After conducting preliminary social surveys in Hamilton and five other Canadian cities for the Methodist and Presbyterian Churches, Bryce Stewart noted in 1913: "Tired of 13 hours night shift in the steel plant at Sydney, the immigrant tries railroad construction out of Fort William, and when winter comes presses on to tend a coke oven or 'work a face' in one of the coal mines of Crow's Nest, or returns east to 'The Soo,' or Hamilton or Montreal or back to the Sydneys."[11] This transiency and instability could create plenty of corporate headaches for iron and steel executives — especially in prosperous periods when labour became scarce.[12] By the end of World War I industrial relations experts would have coined the term "labour turnover" for this informal form of working-class protest.[13]

As competition intensified in the decade before World War I, steel managers became ever more anxious about obstacles to increased productivity. The limited assistance of the bounty system ended in 1910, and all Canadian steel companies recognized the need for "reducing costs in order to keep up the measure of profits."[14] The new Steel Company of Canada initially faced this situation with small, relatively labour-intensive facilities for the production of steel, but the years before the war saw the first wave of a great expansion of productive capacity, with the most up-to-date steel-making equipment, virtually all of it American in origin.[15] A key feature of this new technology, trumpeted through all the trade journals, was its "labour-saving"

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11. F.H. Bell, "Lifting and Conveying Material in the Foundry", *Canadian Foundryman* (hereafter *CF*), XII, no. 3 (March 1921), p. 19; *Times*, 6 April 1907; Bryce M. Stewart, "The Housing of Our Immigrant Workers", Canadian Political Science Association, *Papers and Proceedings* (Ottawa), 1913, p. 98. On itinerant labourers in western Canada, see Edmund Bradwin, *The Bunkhouse Man* (Toronto, 1972); A. Ross McCormack, *Reformers, Rebels and Revolutionaries: The Western Canadian Radical Movement, 1899-1919* (Toronto, 1977), pp. 98-117; John Herd Thompson, "Bringing in the Sheaves: The Harvest Excursionists, 1890-1929", *Canadian Historical Review*, LIX, no. 4 (December 1978), pp. 467-89; Jack London, *The Road* (London, 1967); G.H. Westbury, *Misadventures of a Working Hobo in Canada* (Toronto, 1930).
12. See, for example, *Herald* (Hamilton), 16 April 1910, 19 September 1912; 12 August 1916, 5 July 1917 and 7 September 1918.
13. See, for example, G.W. Austen, "Excessive Labour Turnover and Its Remedies", *Industrial Canada*, XXI, no. 5 (May 1920), pp. 74-75; "Cost of 'Labour Turnover'", *LG*, XX, no. 11 (November 1911), p. 1419; A.O. Dawson, "The Relations of Capital and Labour", *Social Welfare*, II, no. 7 (1 April 1920), pp. 171-72; Paul F. Brissenden and Emil Frankel, *Labor Turnover in Industry: A Statistical Analysis* (New York, 1922).
14. Donald, *Canadian Iron and Steel Industry*, p. 209.
15. Eldon, "American Influence", p. 304.

quality; that is, the new machines reduced the need for manual work and in the process speeded up and streamlined production by eliminating many of the bottlenecks which human labour created. It consequently provided managers with more effective control over the flow and pace of production in their plants. The results were evident by early 1913 when the Steel Company president, Charles S. Wilcox, reported to the shareholders the reasons for the firm's increased earnings: "we have greatly improved our plants and increased the efficiency of our operations, and thereby reduced the cost of production."[16]

This transformation can best be traced by considering the evolving work process in each of the three main departments of primary steel production at the Steel Company of Canada and its predecessors — the blast-furnace, open-hearth, and rolling mill departments. Blast furnace work was quite primitive in the 1890s when the Hamilton company erected its plant on the outskirts of the city. The furnace had to be charged regularly with iron ore, limestone, and coke, and at intervals it was tapped to let the molten pig iron flow out into sand moulds on the casting floor, forming blocks of iron known as "pigs." At the turn of the century coal for various heating purposes would be unloaded from sailing ships by gangs of men assisted by a work horse. Other raw materials arrived by train from Lake Erie and were shovelled out of the railway cars by hand.[17] Labourers then wheeled the stock to the back of the furnace in large, two-wheeled barrows, each holding about twelve hundred pounds; after weighing them, another set of men pushed the barrows into an elevator which carried them up the side of the seventy-five foot furnace. On a platform at the top, half a dozen "top-fillers" emptied the ore, limestone, and coke into the mouth of the furnace — a potentially dangerous job that cost one worker his life in the first year of the furnace's operation.[18]

About every four hours in normal production, the furnace would be tapped. The slag which had formed on top of the molten iron would be run off onto the ground outside the casting house. Visitors to the plant in February 1896 saw "men with crowbars and sledge hammers...on the outer edges of the greyish mass in the yard breaking the cooled parts of a former discharge into handleable chunks, which were carted away to be used as refuse in filling up the waterfront of the property." Meanwhile, back on the casting floor, the hot metal had flowed out of the bottom of the furnace into a network of channels in the sand to set in the "pigs." Men scurried along the little rivers of fire "like the demons in a Kirafly spectacular theatrical hell, poking about with their flaming wooden poles and seeing that each individual piglet

16. Steel Company of Canada, *Annual Report* (Hamilton, 1912), n.p.
17. *Canadian Engineer* (hereafter *CE*), V, no. 2 (August 1897), p. 120; *Stelco Flashes*, XIV, no. 6 (June 1950), p. 7; Gillies-Guy Company Archives (Hamilton), H.W. Robinson Typescript, 14 November 1952.
18. *Canadian Mining Review*, XV, no. 2 (February 1896), p. 39; *CE*, III, no. 7 (January 1896), p. 248-49; *Spectator*, 10 February 1896; Charles Reitell, *Machinery and its Benefits to Labor in the Crude Iron and Steel Industries* (Menasha, Wisc., 1917), pp. 9-10; Ontario, Inspectors of Factories, *Report* (Toronto, 1896), p. 11; *Stelco Flashes*, XIV, no. 6 (June 1950), p. 6; A.R.R. Jones, "A Gigantic Automaton", *Iron and Steel of Canada*, VII, no. 4 (April 1924), pp. 63-64.

was duly 'fed'." Then sand was shovelled over the molten iron until it cooled.[19] Since each pig was still connected to a central cord of iron, labourers had to smash the blocks apart with hammers. The men then loaded them into wheelbarrows, carted them out to a railway car, and heaved them in by hand.[20]

These work routines around the blast furnace began to change in 1907 when the Hamilton Steel and Iron Company added its second blast furnace, which was equipped with new, mechanized devices for moving the raw materials from storage and depositing them in the furnace. On arrival at the plant the stock would be dropped from high trestles through the bottom of railway hopper cars, or else unloaded with "whirlic cranes equipped with grab buckets" onto piles in the storage yard. The same mechanical shovel would be used to load the stock, as needed, into the drop-bottom cars, which would then unload their cargoes into a series of stock bins behind the blast furnaces. Out of the bottom of these bins could be released the desired amount of raw materials onto a small, electrically driven car, mounted on railway tracks. This vehicle, in turn, automatically weighed the stock and emptied it into an elevating device known as a "skip hoist" which lifted and dumped the stock into the top of the furnace with no manual assistance. Gone were all the shovels, wheelbarrows, and brawny labourers, and in their place were a handful of men who manipulated gears.[21]

Work on the front of the furnace, where the casting of pig iron took place, changed more slowly. Eventually the slag was drained into large pots on railway cars and hauled away for dumping. In 1907 the process of breaking up the pigs was mechanized: an overhead electric crane carried the hardened iron to a "hydraulic pig breaker" at the lower end of the casting house, where, as it was broken, the iron dropped into chutes conveying it to railway cars.[22] The expansion of steel production before the war also meant that much more of the molten iron was swept away in giant ladles by electric cranes for use in the open-hearth department, rather than being allowed to harden and broken apart. By the end of World War I the annual output per man in the company's blast furnace department had consequently increased enormously (see Appendix I).

Only in 1920, following wartime labour shortages and wage gains, did the Steel Company finally move to full mechanization of their blast furnace production. That year it installed a pig-casting machine which replaced the more primitive method of casting in sand. Now the molten iron was poured into a slowly moving belt of iron

19. *Spectator*, 10 February 1896; see also Fitch, *Steel Workers*, p. 27; and Lady Bell, *At the Works: A Study of a Manufacturing Town* (London, 1907), pp. 35-42.
20. This task provided F.W. Taylor, the celebrated theorist of scientific management, with one of his most famous experiments, involving Schmidt, the dull-witted Dutch labourer. F.W. Taylor, *The Principles of Scientific Management* (New York, 1967), pp. 41-7.
21. Ontario, Bureau of Mines, *Report* (Toronto, 1908), pp. 301-2; Canada, Department of Mines, Mines Branch, *Report on the Mining and Metallurgical Industries of Canada, 1907-8* (Ottawa, 1908), p. 337.
22. Bureau of Mines, *Report*, 1908, p. 304; Steel Company of Canada, *Annual Report*, 1920, n.p.; E.G. Brock, "Making Pig Iron at Hamilton", *CF*, XIX, no. 2 (February 1928), pp. 7-10; Jones, "Gigantic Automaton", p. 63.

moulds, which cooled the metal quickly, dropped the solid pig iron into a railway car, and then returned under the machine to receive another load of hot metal. The back-breaking labour of the early years had thus been almost completely eliminated, and the number of workers in the company's most strike-prone department could be greatly reduced. "Under the old style it took 150 men per 24 hours to operate a 200 ton furnace and the output was 1.33 tons per man turn," a trade publication reported in 1924. "Under the modern style it takes only 60 men per 24 hours to operate a 550 ton furnace, and the output is 9.17 tons per man turn."

In the second stage of steel production, the metal was moved to the open-hearth department, where the pig iron was transformed into steel. This had been the arena of the industry's greatest technological changes in the late 19th century, when the patient craftsmen at small puddling furnaces were replaced by a new, more mechanized process for refining pig iron into a tough, resilient steel. In a long row of open-hearth furnaces, molten pig iron and a quantity of scrap metal were exposed to the intense heat of a gas flame to remove impurities and were combined with certain chemical agents to provide the carbon necessary for hardness. For charging pig iron and scrap into the furnaces, the company had the material loaded into steel boxes on a train which ran through the stock yard. An "electric charging machine" picked up the boxes, emptied the contents into the furnace, and returned them to the train for refilling. Before the adoption of these charging machines, six to eight men would have taken nearly six times as long to charge each furnace by hand. The first two furnaces at the Hamilton Steel and Iron Company were tilting models which poured the molten steel directly into small ingots. By 1908 giant ladles suspended from travelling cranes were being used to catch the fiery stream of molten steel from the now stationary furnaces and were drained into the ingot moulds (in the jargon of the industry, these two steps were known as "tapping the heat" and "teeming the ingots"). In the post-merger expansion of the Steel Company's open hearth facilities, a specially-designed crane was also installed for stripping the moulds from the ingots, a process which eliminated the difficulty and hazards of loosening by hand any moulds which stuck.[23] With the effective use of all of this machinery, the annual output per man in the open-hearth department rose from an average of 156 tons between 1901 and 1904 to 996 in 1919 (see Appendix II).

In the third main arena of Hamilton's iron and steel production, the rolling mills department, the steel ingots were passed several times through mills of various sizes to create a variety of usable shapes. Large, bulky "blooms" were reduced to smaller "billets" and then to bars, channels, rods, and so on. Before the major post-merger innovations, the rolling mill facilities of the Hamilton Steel and Iron Company remained much as they had in the last decades of the nineteenth century. The old

23. *CE*, VIII, no. 1 (July 1900), pp. 46-47; *Iron Age*, 5 July 1900, p. 7; Bureau of Mines, *Report*, 1908, p. 303; Reitell, *Machinery*, pp. 23-24, 29; Frank Popplewell, *Some Modern Conditions and Recent Developments in Iron and Steel Production in America* (Manchester, 1906), p. 96; Steel Company of Canada, *Annual Reports*, 1912-13; *Canadian Mining Journal*, XXXIV, no. 5 (1 August 1913), pp. 488-89; *Canadian Machinery* (hereafter *CM*), IX, no. 1 (2 January 1913), p. 56; *CF*, VI, no. 12 (December 1915), p. 217; Fitch, *Steel Workers*, p. 46.

Ontario Rolling Mills lacked the large rolls for blooms and billets, and its four trains of rolls were smaller "merchant" and "guide" mills producing mostly iron bars which were then refined into bolts, nails, axles, horseshoes, and many other articles. The two new sets of rolls incorporated into the new steel plant in 1900 were similarly small and turned out steel bars.[24] The men who worked on these rolls used muscle and skill in wielding their tongs, as they pulled the hot bars from the reheating furnaces and thrust them into the successive sets of rolls.[25] Many years later, a half-century veteran of Stelco recalled the particularly tough job of pushing the sizzling hot metal bars by hand along a set of rollers to the giant shears which trimmed their length:

> Heavy sections were moved from one end of the mill, into position for shearing, by a cable operated by a drum located at the other end of the mill. After the section was hauled in place a man took the end of the cable over his shoulder and hauled it back to be hooked onto the next section.[26]

The new installations of 1912-13 which diversified the range of rolled products changed the company's rolling mill work dramatically. They won international acclaim for the efficiency of the continuous, electrically driven system of production which eliminated all the heaving and shoving between rolls. As the *Canadian Foundryman* noted in surveying the new operations: "Modern rolling mills are really automatic machines on a large scale, one machine sometimes covering an acre or more of ground, and operated by a few men almost entirely without hard muscular labour." Wire rods, the journal noted, were rolled "by the pure continuous process, and the steel is not touched by hand from the time the billets leave the stock pile until the coiled rods are taken from the bundle conveyor." Robert Hobson, the Steel Company's president, boasted to the American Iron and Steel Institute in 1919 that the new electrically driven reversing blooming mill required only one easily trained operator per shift, who sat high on a platform, or "pulpit," overlooking the rolls and the automatic machinery.[27]

Did Hamilton's steelmasters introduce all this new technology purely to get a tighter rein on the work process in their plants, in a willful assertion of authority? The question is complicated, since some of the innovations were within existing operations, while many were part of completely new installations, especially new rolling-mill facilities. In some instances the machinery undoubtedly solved longstanding management problems, but the prime impetus for its introduction undoubtedly came from

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24. Child, "Iron Trade"; *Hamilton: The Birmingham of Canada* (Hamilton, 1892), n.p.; Bureau of Mines, *Report*, 1908, pp. 307-8; American Iron and Steel Institute, *Directory* (New York, 1916), p. 307.
25. Fitch, *Steel Workers*, p. 51. A 1906 photograph of a group of Hamilton Steel and Iron Company rolling mill hands reveals both the muscles required and the tongs still used in their work. See Craig Heron, Shea Hoffmitz, Wayne Roberts, and Robert Storey, *All That Our Hands Have Done: A Pictorial History of the Hamilton Workers* (Oakville, 1981), p. 42.
26. *Stelco Flashes*, XIV, no. 6 (June 1950), p. 9.
27. Kilbourn, *Elements Combined*, p. 93; *CF*, IV, no. 9 (September 1913), pp. 142-44; *Canadian Mining Journal*, XXIV, no. 5 (1 August 1913), p. 489; American Iron and Steel Institute, *Yearbook* (New York, 1919), p. 414.

market conditions, which demanded higher volume production at lower costs. Above all, the speed and reliability of all the charging and conveying devices promised a larger output of cheaper steel. Still, the modern American technology which the Hamilton steel men bought embodied many years of experimentation in American steel plants, aimed overtly at eliminating manual labour and reducing workers' shopfloor control over production processes. Consequently, whether or not the new technology was seen explicitly as a management tool for imposing order on an unstable work process, it did guarantee the company's managers more control over the pace and flow of production. Their reliance on the individual initiative or inclination of their workmen, both skilled and unskilled, was reduced, and more easily monitored machinery now filled the plants.

Technological change thus occurred in steel plants like those of the Steel Company of Canada not primarily to lighten the workers' burden but to serve corporate needs for greater predictability and productivity. So-called "labour-saving devices" were meant to save money, not sweat (and as Appendix III indicates, the savings were considerable). The net result was the elimination of some of the most unpleasant, backbreaking work, but simultaneously the speeding up of production for the workers still needed in the plants. As a result of these changes in the work process, steel plants became huge, smokey, deafeningly noisy caverns filled with massive, towering machinery which dwarfed the workmen toiling below. Brilliant, fiery flashes from the mouths of furnaces or showers of sparks from cauldrons of molten steel penetrated the gloom and seared the flesh of any nearby workers. If the men were not scampering out of the way of ladles, moulds, and great hunks of glowing iron and steel which soared through the air at the end of giant cranes, they were dodging locomotives or charging machines whose tracks criss-crossed the plant. Predictably, these ever-present dangers produced appalling accident rates: in 1916, for example, the Steel Company's Hamilton plants produced 488 serious accidents requiring at least a week off work, one of which was fatal — amounting to nearly one worker in six on the firm's payroll (see Appendix IV).[28] Although production was fully integrated throughout the company's Hamilton operations by World War I and was normally continuous (hence a twelve-hour working day), its rhythms were erratic, requiring frenzied bursts of strenuous exertion from its workers as the metal was charged, heated, tapped, poured, or rolled into shape. It was a form of mass production which did not involve the monotonously repetitive tasks of an auto plant or a textile mill, but it was nonetheless physically demanding.[29]

As the Hamilton steelmasters turned to machines to replace men, they also undertook to make the fullest use of the workers they still needed. From the turn of the century they adopted the North American practice of intensifying the labour process by "driving" their workers, especially the common labourers, as hard as possible to extract the maximum effort from them in the gruelling twelve-hour days (eleven hours on the day shift, thirteen at night) which would last in Hamilton until 1930. In order to maintain this direct, authoritarian pressure, the steel company managers found that

28. Inspectors of Factories, *Report*, 1916, pp. 15, 48.
29. *Cf.* Stephen Meyer III, *The Five Dollar Day: Labor Management and Social Control in the Ford Motor Company, 1908-1921* (Albany, 1981).

they had to restructure the ethnic composition of their work force. In part, the problem for the company was finding Anglo-Canadian workers who would tolerate the long hours and unpleasant labour in its plants. As early as 1901 the *Labour Gazette*'s correspondent reported the firm's difficulties in obtaining sufficient unskilled labour "owing to the opportunities for employment for such men elsewhere and the heavy nature of the work in and about the smelter." Two decades later, when returned soldiers were demanding jobs, the city's Ontario Employment Bureau found few of them willing to accept employment in the steel plants.[30] Equally important, however, was the testiness and independent-mindedness of English-speaking workmen.

The first major confrontation with these workers – and apparently a crucial turning point in the ethnic recomposition of the work force – came in the spring of 1902, when between sixty-five and seventy Anglo-Canadian labourers around the blast furnace struck for a 10 per cent wage increase. "We have a body of men second to none in the city," their spokesman insisted, "and we are paid the magnificent sum of 15, 16 and 16½ cents per hour for the work that only the strongest and most rugged men can do, and we have to work in all weathers and seven days a week...." Rumours began to circulate that the men would like to abolish the twelve-hour day and were taking the first steps toward unionization. It was no doubt this stubborn aggressiveness which would prompt a Steel Company executive to blurt out a decade later, "the English workman is the cause of more labour troubles than any other nationality." To combat such a spirit of resistance among its labourers the company recruited strikebreakers, including a trainload of Italians from Buffalo, who were encouraged to camp in makeshift shacks on the company property. The strike was broken, and the shanties became permanent quarters for many of the company's labourers.[31]

The shift to European migrant labourers in blast furnace work was so thorough within five years that the next strike in that department, in the spring of 1907, involved only "foreigners," mostly Italians, and by the war the newcomers comprised some three-fifths of the company's work force. By 1918 the superintendent of the Ontario Labour Department's Employment Bureau in Hamilton could report that the "foreigners" did "practically the whole of the heavy and laborious work" in the city's iron, steel, and metal-working plants. The city's ethnic mix similarly shifted, so that by the 1920s more than one male worker in ten was European born. For the Steel Company this new work force was cheap: between 1910 and 1920, for example, the company's wage bill for blast furnace work stayed relatively constant at around $300,000, while the value of pig iron production doubled from just under $3 million to nearly $6 million and company profits quadrupled to some $2 million. "It would be a very serious matter to do away with foreign labour," a company official warned in 1919 during heated debates about deporting the "aliens." "If we expect returned soldiers to

30. *LG*, I, no. 5 (January 1901), p. 223; *Spectator*, 3 March 1919.

31. *Times* (Hamilton), 10, 11 and 14 April 1902; *Spectator*, 11 April 1902 and 18 October 1905; Kilbourn, *Elements Combined*, pp. 121 and 124; Public Archives of Canada (hereafter PAC), RG 27, vol. 299, file 3475.

do the rough, rugged work, many of us would be out of business because we could not produce at anything like low enough cost."[32]

The needs of Hamilton's steelmakers actually meshed well with those of the migrant labourers from southern and eastern Europe who were flooding into North America in the early 20th century. Driven by worsening underemployment, overpopulation, and agricultural depression, many men in Italy's *Mezzogiorno* and similar agricultural regions in eastern Europe had begun a process of seasonal migration to earn cash that might help to better the situation of themselves and their families in their homelands.[33] Ethnic intermediaries, especially labour agents, helped to funnel these men into available jobs, and, once a particular employer had developed an acknowledged preference for Europeans, informal networks of communication would carry the news back to the villages to direct future migrants to specific locations like Hamilton. "Each nationality has one or more citizens who keep their eyes open in the

32. Because Stelco has consistently denied researchers access to its archives, it has not been possible either to determine the ethnic distribution of workers among the various departments or to compute detailed tables of wage rates or earnings. Fragmentary data drawn from scattered press accounts and government sources indicate that the basic hourly wage rate for labourers in the steel plants hovered in the fifteen to seventeen cent range between 1902 and 1915 — well below the twenty cents per hour which the Department of Labour estimated to be the average wage for factory labourers in Hamilton in 1915, or the twenty-five cents per hour earned by the civic labourers. In contrast, the cost of food in the city had risen by 53.7 per cent between 1900 and 1913. Wage rates chased soaring living costs during the war, reaching 37½ cents per hour in 1919, but falling again in the early 1920s. Wages and prices seem to have remained relatively stable in the 1920s. *Spectator*, 8 April 1907 and 15 February 1919; PAC, RG 27, vol. 294, File: "Reports — Employment Offices (B-N)", Hamilton; Canada, *Census* (Ottawa), 1921, II, p. 456; IV, p. 401; *LG*, XVI, no. 5 (November 1915), p. 620; XXI, no. 3 (March 1921), p. 472; XXX, no. 12 (December 1930), p. 1468; Canada, Board of Inquiry into Cost of Living, *Report* (Ottawa, 1915), II, p. 142; *Herald*, 18 February 1919; Canada, Department of Labour, *Wages and Hours of Labour in Canada, 1920-1929* (Ottawa, 1930), p. 38.

33. The condition of the southern and eastern European peasant in this period is discussed in Robert F. Foerster, *The Italian Emigration of Our Times* (New York, 1919), pp. 64-105; Robert F. Harney, "Men Without Women: Italian Migrants in Canada, 1885-1930", *Canadian Ethnic Studies*, XI, no. 1 (1979), pp. 29-47; Antonio Pucci, "The Italian Community in Fort William's East End in the Early Twentieth Century", (M.A. thesis, Lakehead University, 1977), pp. 1-60; Virginia Yans-McLaughlin, *Family and Community: Italian Immigrants in Buffalo, 1880-1930* (Ithaca, 1977), pp. 25-36; Orest T. Martynowych, "Village Radicals and Peasant Immigrants: The Social Roots of Factionalism among Ukrainian Immigrants in Canada, 1896-1918", (M.A. thesis, University of Manitoba, 1978), pp. 10-60; William I. Thomas and Florian Znaniecki, *The Polish Peasant in Europe and America*, 5 vol. (New York, 1918-20), I, pp. 87-302; Josepf J. Barton, *Peasants and Strangers: Italians, Rumanians, and Slovaks in an American City, 1890-1950* (Cambridge, Mass., 1975), pp. 27-47; Caroline Golab, *Immigrant Destinations* (Philadelphia, 1977), pp. 43-100; Frank H. Serene, "Immigrant Steelworkers in the Monongahela Valley: Their Communities and the Development of a Labor Class Consciousness", (Ph.D. thesis, University of Pittsburgh, 1979), pp. 26-51; Frank Thistlethwaite, "Migration from Europe Overseas in the Nineteenth and Twentieth Centuries", in Herbert Moller, ed., *Population Movements in Modern European History* (New York, 1964).

interest of their people," a Hamilton workingman noted in 1914, "and a very striking instance of this may be noted from the fact that one will often see a gang of Italians or Poles, etc., being led around to the various factories by one of their interpreters to help them 'land a job'. "[34]

The seasonal cycles were often extended into longer sojourns on this side of the Atlantic, especially if unemployment, accident, or ill health had eaten up the labourer's savings, but a large percentage still returned home. The lifestyle of the city's so-called "foreign colony" reflected the unwillingness of most European newcomers to settle. During their sojourn they shared cramped quarters in boarding houses with their fellow countrymen. The great majority of them were men in the prime of life; women comprised only 29 per cent of the city's foreign born in 1911 and still only 37 per cent twenty years later. In 1913 Methodist and Presbyterian investigators conducted a detailed survey of a block of immigrant housing near the Steel Company's east-end plant. In seventeen eight-roomed houses occupied by Italians, Bulgarians, Poles, Rumanians, and Macedonians, they found 232 men, nineteen women, and twelve children; 213 of the men were single, either boarding or living co-operatively. As a census-taker had discovered two years earlier, the men ate and slept in shifts and "the beds never grow cold." Such a lifestyle was, of course, quite cheap in comparison with that of Anglo-Canadian working class families and allowed the European migrants both to accept lower wages and build up their savings.[35]

The immigrants' desire for quick money was a boon to employers like Hamilton's steelmasters who were undertaking to intensify production in their plants. The transiency of these men seemed to make them willing to endure the unpleasant work at low wages, and their unfamiliarity with workplace routines in a city like Hamilton

34. Robert F. Harney, "The Commerce of Migration", *Canadian Ethnic Studies*, IX, no. 1 (1977), p. 42-53; and "Montreal's King of Italian Labour: A Case Study of Padronism", *Labour/Le Travailleur*, IV (1979), pp. 57-84; Jane Synge, "Immigrant Communities — British and Continental Europeans — in Early Twentieth Century Hamilton, Canada", *Oral History*, IV, no. 2 (Autumn 1976), pp. 38-51; Matthew James Foster, "Ethnic Settlement in the Barton Street Region of Hamilton, 1921 to 1961", (M.A. thesis, McMaster University, 1965); Diana Brandino, "The Italians of Hamilton, 1921-1945", (M.A. thesis, McMaster University, 1977); *Herald*, 31 August 1912; *Labor News*, 30 October 1914.

35. *Census*, 1911, II, p. 427; 1931, II, p. 746; *Special Report on the Foreign-Born Population* (Ottawa, 1915), pp. 46-47; *Spectator*, 17 June 1904, 18 October 1905 and 27 October 1906; *Herald*, 5 June 1911 and 31 August 1912; "The Housing Situation in Hamilton", *Canadian Municipal Journal*, VIII, no. 7 (July 1912), pp. 255-56; Methodist Church, Department of Temperance and Moral Reform, and Presbyterian Church, Board of Social Service and Evangelism, *Report of a Preliminary and General Social Survey of Hamilton* (n.p., [1913]) p. 39; Bryce M. Stewart, "The Housing of Our Immigrant Workers", Canadian Political Science Association, *Papers and Proceedings* (1913), p. 107; Robert F. Harney, "Boarding and Belonging", *Urban History Review*, 2-78 (October 1978), pp. 8-37. The similarities of this marginal social life with that of modern "guest workers" are, of course, striking. See Stephen Castles and Godulka Kosack, "The Function of Labour Immigration in Western European Capitalism", *New Left Review*, 73 (May - June 1972), pp. 3-21; John Berger and Jean Mohr, *A Seventh Man* (Harmondsworth, 1975); and Michael J. Piore, *Birds of Passage: Migrant Labour and Industrial Societies* (London, 1979).

made them a pool of apparently docile, easily exploited labour. Their instrumental orientation to their jobs was particularly adaptable. Two American scholars, for example, noted in 1918 how itinerant Polish peasants in Europe had already adjusted their work rhythms in order to earn as much and as fast as possible:

> The peasant begins to search, not only for the best possible remuneration for a given amount of work, but for the opportunity to do as much work as possible. No efforts are spared, no sacrifice is too great, when the absolute amount of income can be increased. The peasant at this stage is therefore so eager to get piece-work. It is well known in Germany that good Polish workers can be secured only if a large proportion of piece-work is offered them.... They take the hardship and bad treatment into account, but accept them as an inevitable condition of higher income. When they come back [home], they take an absolute rest for two or three months and are not to be moved to do the slightest work....[36]

By using ethnic sub-foremen known as "straw bosses" to organize and discipline the work groups in their plants, the steel company got the strict authoritarian style of management they sought. The tyrannical rule of the foreman in Hamilton became notorious, and a company executive admitted in 1919 that "we have more trouble through workmen and foremen than anywhere else...."[37]

The additional advantage of this new work force for the steelmasters was the cultural gulf which set them apart from the rest of the city's working class and inhibited class-conscious activity. These were men from peasant backgrounds whose ties were usually stronger with family and village across the Atlantic than with fellow workers a few blocks away. Their presence, moreover, was deeply resented by many of Hamilton's Anglo-Canadian workers, who feared that the newcomers could bring about the degradation of work and living standards in Canada. In 1910, when hundreds of Europeans organized the city's biggest steel strike of the period, the English-speaking workers remained aloof. In 1912 the Steel Company precipitated an unsuccessful strike by its wire-drawers when it put two Poles to work in their shop. By the end of World War I the "anti-alien" sentiment had reached hysterical proportions, and in February 1919 a boisterous crowd of ten thousand, in which "returned soldiers and working men seemed to predominate," demanded the deportation of "enemy aliens and other undesirables."

In 1910, in a moment of unusual candour, the Hamilton *Herald* had summarized the special advantages of immigrant labour for the city's steel company:

> The fact that almost all of the steel and iron workers are foreigners and single men who have no real place in the life of the city, who know nothing about our civic and

36. Thomas and Znaniecki, *Polish Peasant*, I, p. 199. See also David Montgomery, *Workers' Control in America: Studies in the History of Work, Technology, and Labor Struggles* (Cambridge, 1979), p. 37.

37. PAC, RG 27, vol. 297, file 3231; Labour Canada Library (Hull), Canada, Royal Commission on Industrial Relations, "Evidence" (typescript), III, p. 2316. See also Wayne Roberts, ed., *Baptism of a Union: The Stelco Strike of 1946* (Hamilton, 1981), pp. 12-15; Brandino, "Italians," pp. 69-70; Robert Henry Storey, "Workers, Unions and Steel: The Shaping of the Hamilton Working Class, 1935-1948", (Ph.D. thesis, University of Toronto, 1981), pp. 208-11.

> national affairs, and who are here only for the money they make and will be away once they have saved a sufficiency, and whose standard of living is below that of the average English-speaking workman, makes the public comparatively indifferent to their claims. Thus the great manufacturing corporations serve a double purpose when they import cheap labour from continental Europe. They get work done at a cost less than the cost of getting it done by English-speaking workmen, and they prevent the enlistment of public opinion on the side of the workers when troubles arise with their foreign employees.[38]

Thus the efforts to revamp the work process in Hamilton's steel industry brought hundreds of European labourers inside the factory walls to be driven by relentless foremen for twelve hours a day at the lowest wage rates in the city — jobs made bearable only by the expectation of imminent departure. By 1910 the fierce heat, smoke, noise, and heavy labour had won for steel plant jobs a reputation among the city's labourers as "the lowest on the scale."[39]

The whole work force in the steel industry, however, could not be flooded with transient labourers. Some work in a steel plant still required a degree of skill or at least familiarity with the job. The company's approach to this small skilled portion of its workers revealed a desire to keep them in their jobs and to promote a quiescent loyalty to the firm and its managers. Primarily the company appealed to steelworkers' concern for economic security. In the first place, it made promotions to higher paying jobs from within its own work force, and thus increased their more ambitious workers' dependence on the corporation for advancement. Secondly, it initiated a range of welfare programmes which tied workers to long-term benefit schemes and encouraged them to identify their economic security with the corporation. An employees' benefit society organized in 1902 provided insurance against sickness and death, and a limited stock-subscription plan and a pension fund were added in 1912 and 1918 respectively. The Steel Company's vice-president, F.H. Whitton, explained to a royal commission in 1919 that these welfare-capitalist measures were not acts of philanthropy towards the firm's employees, but were intended "to give them a direct interest in the business, and promote continuity of effort and permanence of employment," since "continuous and contented service is an asset to any company." This "continuous and contented" faction of the work force nonetheless remained small and restricted: after seven years the stock-option plan had drawn only 629 subscribers, out of more than four thousand

38. *Spectator*, 1 April 1910 and 11 February 1919; PAC, RG 27, vol. 299, file 3475; *Herald*, 4 April 1910.
39. *Ibid.*, 16 April 1910.

employees, and the exclusively Anglo-Canadian names on the executive of the benefit society indicated limited participation by the European-born steelworkers.[40]

In the Hamilton steel industry, therefore, we can see three processes at work in the organization of work and the management of labour aimed at strengthening management control: the increasing substitution of machinery for manual labour, both skilled and unskilled; the intensification of labour through the old-fashioned authoritarian management of a raw, inexperienced work force and through wage-incentive schemes, and the development of promotion and welfare policies to stabilize the more skilled element among the workers. By the 1920s the incorporation of managerial control within new technology had probably become more important than pure authoritarian rule or welfare capitalism, but the tyranny of the foreman would nonetheless last until the consolidation of industrial unionism in the 1940s.[41]

A new industry thus gave birth to a new category of mass-production workers, the steelworkers. One striking characteristic of this new work force was its occupational homogeneity: old-time craftsmen had largely disappeared and labourers were needed in much smaller numbers. It would, of course, be an exaggeration to claim that mechanization completely eliminated manual labour from the works. Many technical articles in trade journals which gleefully noted the "labour-saving devices" usually failed to take account of inevitable mishaps, delays, and clean-up and maintenance functions. Moreover, in open-hearth work, muscle and discretion were still needed among the men at the furnace doors. At regular intervals the melter's helpers (usually three per furnace) had to face the gates of hell with shovelfuls of dolomite and other chemicals — reputedly "one of the hardest and hottest jobs known in the steel business." Similarly labourers still had to shovel piles of manganese into the ladles of molten steel. In addition, while the steel was cooking in the furnace, the first-helper on each furnace was responsible for carefully scrutinizing the heat and testing the carbon content of the brew. Quality control still demanded this independent judgement among the few workers left on the furnace floor. Similar discretion was still required of some rolling-mill hands, notably in the sheet mill. Yet surveying the work process in the Hamilton steel plants as a whole, what was striking was how drastically the new

40. Canada, Royal Commission on the Relations of Capital and Labour, *Report: Evidence — Ontario* (Ottawa, 1889), p. 821; Ontario, Inspector of Insurance and Registrar of Friendly Societies, *Report* (Toronto, 1902), C130; *Herald*, 28 April 1911, 16 January 1912 and 10 January 1916; *LG*, XIV, no. 2 (August 1913), p. 117; XXIX, no. 6 (June 1929), p. 649; Royal Commission on Industrial Relations, "Evidence", III, pp. 2289, 2299; *Spectator*, 4 October 1928; *CF*, XVI, no. 1 (January 1925), p. 31. All the men interviewed for Stelco's commemorative publication in 1950 had risen modestly on the company's job ladders. See *Stelco Flashes*, XIV, no. 6 (June 1950). On this phenomenon of an internal labour market, see Fitch, *Steel Workers*, pp. 141-42; Brody, *Steelworkers*, pp. 85-87; Katherine Stone, "The Origins of the Job Structures in the Steel Industry", *Radical America*, VII, no. 6 (November - December 1973), pp. 40-43; Richard Edwards, *Contested Terrain: The Transformation of the Workplace in the Twentieth Century* (New York, 1979), p. 131; Michael Burawoy, *Manufacturing Consent: Changes in the Labor Process under Monopoly Capitalism* (Chicago, 1979.)

41. Roberts, *Baptism of a Union*, pp. 12-15.

technology had reduced the need for both highly skilled men and a large unskilled labour force.[42]

In fact, the old nineteenth-century dichotomy of craftsman and labourer had been replaced by a less sharply differentiated body of workers, a large percentage of whom were machine operators. As a business journalist remarked after a tour through Hamilton mills (which he dubbed a "gigantic automaton"), the innovation in the work process had "changed steel plant operation from an undertaking which required heavy physical labor from all its followers to one in which the labor involved consisted mainly in the supervision and maintenance of machinery." The term for this new work force which became current in the early twentieth century was "semi-skilled" but the phrase disguised how little skill was required in most jobs and how easily these workers could be replaced. In his address to the American Iron and Steel Institute in 1919, Robert Hobson proudly announced that in four and a half years of operating the company's new electrically driven blooming mill, less than an hour and a half had been necessary for "breaking in new men to operate the motor for the mill."[43] These new steelworkers may have been required to exercise more responsibility for their machinery and its output than labourers, but their knowledge of the whole production process, their training, and their control over the form and pace of the work was negligible alongside the old craftsmen.

Several factors reduced the impact of this increasing homogeneity. Ethnic barriers between groups of steelworkers were no doubt the most important, especially in separating the more skilled English-speaking workers from the much larger number of Europeans. At the same time the company's widespread use of piece rates, instead of hourly wages, tended to encourage individual effort over broader identification with fellow workers across the plant (though the fact that workers usually worked in gangs which collectively earned the piece rates gave the system a somewhat more co-operative spirit). Such incentive schemes seem to have had the desired impact since most of the strikes at the steel plant in this period involved labourers paid by the hour, rather than pieceworkers. In 1923 the company's blast furnace superintendent described "good incentive wages" as one of the keystones of the firm's industrial relations policies.[44] Its graduated job ladders were similarly designed to encourage individualism, with minute distinctions in pay between semi-skilled jobs. In 1916, for example, in the Steel Company's munitions department, men in shipping and pure labouring were paid 26 cents an hour, tongsmen, stackers, gaugers, stampers, wheelers, stamp carriers, annealers, annealing bedmen, chargers and doormen got 27 cents, heater helpers, swabbers, and press operators 30½ cents, punch setters 33 cents, and

42. *Spectator*, 16 October 1912; Charles Rumford Walker, *Steel: The Diary of a Furnace Worker* (Boston, 1922), pp. 21-26, 46-47, 52-53, 70 and 84; Jones, "Gigantic Automaton", 103; *Stelco Flashes*, XIV, no. 6 (June 1950), p. 7; Popplewell, *Modern Conditions*, p. 103; Kilbourn, *Elements Combined*, p. 119.

43. Jones, "Gigantic Automaton", p. 118; American Iron and Steel Institute, *Yearbook*, 1919, p. 414.

44. University of British Columbia Library, Special Collections, James Robertson Papers, Box 5, File 1, "Notes from Conversations with Officers of the Steel Company of Canada, Hamilton, Ontario, Dec. 21/23."

heaters 38 cents.[45] Such a spread of pennies per hour could create new levels of competition for promotion to higher job categories.[46] It remains to ask how effectively workers with broadly similar occupational status overcame these fragmenting forces to act together in pursuit of their own interests.

II

As we have seen, mass-production processes in the steel industry grew up in a context of great geographic mobility among large numbers of Canadian workers — the so-called "floaters." From the perspective of these men, a stint in a steel mill was primarily a chance to earn some quick cash before moving on. If the job became intolerable, absenteeism and quitting became the most common responses. "If a laboring man working in, say an ironworks, revolts at the conditions of life and labor," a socialist worker wrote in 1906, "well he may clear out and go west, or he may find other work, railroad building or in the mines. The demand for labor and constantly shifting habits of a large number of workers are a 'safety valve' which ward off the social revolution."[47] This kind of purposeful drifting reached a peak during World War I, when the Hamilton press noted "a floating population that keeps in constant circulation to those cities and towns where labor is scarce and wages good," and when one Hamilton plant normally employing fifteen hundred men had twenty-three hundred quit in three months.[48] Large numbers of workers in steel and other mass production industries, it seems, developed only casual, instrumental contact with the work processes which efficiency-conscious managers were introducing.

Any more collective resistance to intolerable working conditions was, of course, extremely difficult for workers with few skills who could usually be quickly replaced. The vigorous repression of the 1902 strike set the pattern of anti-unionism among Steel Company executives. By World War I, in fact, the company was using a spy system to keep track of trouble-makers. A pervasive fear became a severe brake on working-class protest in Hamilton's steel plants.[49] Yet, despite workers' individualized strategies of survival and managers' authoritarian power, company officials did not run their plants unchallenged. Hamilton's steelworkers soon began to assert their own needs within the industry and to contest some basic tenets of their employer's management policies.

45. PAC, RG 27, vol. 305, file 16 (37). Without access to company records it is difficult to date the company's adoption of these job ladders, but, according to the local press, the resolution of a major strike in 1910 involved investigations of wage structures in the United States and the introduction of several new gradations in wage rates. *Times*, 2 April 1910; *Herald*, 13 April 1910.

46. In their experiences in American steel plants at the end of World War I, Charles Rumford Walker and Whiting Williams saw some of this attitude among "pit men" in the open-hearth department who eyed the slightly better paid jobs of helpers on the "floor" in front of the furnace. *Steel*, pp. 30-31; *What's On the Worker's Mind, By One Who Put On Overalls to Find Out* (New York, 1921), p. 21. See also Stone, "Job Structures", pp. 40-43; and Edwards, *Contested Terrain*, p. 131.

47. *Western Clarion*, 30 June 1906.

48. *Herald*, 29 September 1916; *Spectator*, 8 August 1916.

49. PAC, Sir Joseph Flavelle Papers, MG 30, A 16, vol. 2, file 11, Department of Labour, R. Hobson to J.W. Flavelle, 8 July 1916; Royal Commission on Industrial Relations, "Evidence," III, p. 2429.

The response of Hamilton's steelworkers to their evolving work environment fell into two phases, roughly divided by the war.

In contrast to other industries with a greater artisanal residue, the steel industry was not disrupted by beleaguered craftsmen.[50] Instead, pre-war collective action came in the form of spontaneous militancy among the hundreds of Europeans in the company's plants. Despite their transiency these men revealed a determination to fight for good wages during their sojourn in North America and thus challenged the steelmasters' low-wage strategy. In the tightly packed immigrant ghettoes the men cultivated ethnic solidarities in boarding houses, cafes, mutual benefit societies, and churches, which encouraged them to stand up to their employers. The Steel Company consequently had to deal with six large strikes by its immigrant employees before World War I and four more during the war. Although details of these confrontations were seldom fully recorded in the local press, it is clear that they were more than simply chaotic riots and showed evidence of careful timing and effective, if impromptu, organization. The most dramatic was a full-scale walk-out in April 1910.[51]

The workers, mostly Italians, with a sprinkling of Poles and Hungarians, had been agitating for a wage increase from their fifteen cent per hour rate. To meet the rising cost of living, they wanted a new wage scale of seventeen, eighteen, and twenty cents per hour and decided to press their advantage in a situation of labour scarcity. On 22 March the company decided to announce a one cent increase effective 1 April to head off any dispute, but the gesture could not halt the growing feeling for a strike. On the night of 30 March a mass meeting of "foreigners" alerted the company to trouble. The next morning the men arrived at work as usual, but ten minutes after starting up they threw down their tools and walked out of the company's plants. The firm estimated between eight and nine hundred men were out, while the strikers set the figure at more than twelve hundred. "No union exists among the foreigners except the union of brotherhood," reported the *Spectator*, "and they realize that the union does not include English-speaking employees of the steel works, for so far as can be learned no attempts were made to get them to strike."[52]

Little knots of workers hung around the yards shouting and tossing stones at reluctant strikers, and one group that attempted to re-enter the blast furnace scattered quickly when one of the twenty policemen drew his pistol on them. In dispersing the crowds on adjoining farmlands, a constable narrowly missed being struck down by a striker, but, although picketing continued all day, this incident was the closest to violence in the first day's events. Some of the strikers helped to dump slag and to bank the blast furnaces so that no damage would be done to the equipment. Later in the

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50. *Cf.* Craig Heron, "The Crisis of the Craftsman: Hamilton's Metal Workers in the Early Twentieth Century", *Labour/Le Travailleur*, VI (Autumn 1980), pp. 7-48.

51. The following account of the 1910 strike is based on reports in the *Herald*, *Spectator*, and *Times* for 1-5 and 12-13 April 1910 and on PAC, RG 27, vol. 297, file 3231.

52. *Spectator*, 1 April 1910. This division along ethnic lines contrasts with the dramatic strike at Pennsylvania's Bethlehem Steel Company which had begun in February 1910, but there the skilled machinists initiated and led the strike. See Robert Hessen, "The Bethlehem Steel Strike of 1910", *Labor History*, XV, no. 1 (Winter 1974), pp. 3-18.

afternoon a foreman addressed a crowd of strikers outside the plant and convinced thirty of them to return to work. But on the whole the strike was holding firm.

The company had immediately put on a stern face, refusing to discuss any grievance or to take back certain of the strikers. It placed the blame for the walk-out squarely on the "foreign agitators, so-called interpreters who do not work themselves." The *Spectator*, whose publisher, William Southam, was the company's largest shareholder, reported, "The trouble with the interpreters is that they incite the men to strike and riot, according to some workmen at the plant, and the foreigners follow like sheep." Unfortunately the available sources tell us nothing more about the role of these "agitators" in the strike, which the hysterical tone of the *Spectator* may have exaggerated. Perhaps this articulate leadership with valuable English language skills was spreading the word about the large organizing drive which had begun in the American steel mills that winter under American Federation of Labour auspices. In any case, the report of their activities underlines the important leadership role of non-proletarian elements in the ethnic ghettoes.[53]

Hamilton's polite society was stunned by this new alien force rearing up in its midst. "The police fear," the local press announced, "that the quiet manner in which the foreigners are going about the strike at the present time will only be a calm preceding a storm." The fear of impending violence was inflated by rumours that the immigrants had been purchasing second-hand guns and by police suggestions that "every foreigner on strike carries his native weapon a knife...." The *Times* published an alarmist report that "the men who are on strike are the very hard kind of Italians to deal with. They are natives of Sicily, and are a different breed altogether from the up-country Italians." A Roman Catholic priest had expressed to the reporter his concern "that if they are aroused they will resort to riot without hesitancy, and...that the authorities do not know fully what class of men they are dealing with." The company quietly moved a stash of dynamite used for blasting slag to a building half a mile from the steel plant, and constables on duty made sure that "every foreigner who turned up within half a mile of either the rolling mill or smelter without a dinner pail and a satisfactory explanation, was ordered to move on." An air of mystery and danger hung over the "foreign colony" in those early spring days:

> Last night the strikers were holding secret meetings. The minute an English-speaking person begins to ask questions they become suspicious and shut up tighter than a clam. Around the district known as "Little Italy" little groups of foreigners were assembled, apparently discussing the situation, but directly a Britisher hove in sight not a word was heard until he had passed out of hearing distance.[54]

On the afternoon of the second day Robert Hobson, the company's vice-president and general manager, met a delegation of foremen and convinced them to lead the strikers back to work while a committee discussed their grievances. By the night of 2 April the east-end steel plant was back to normal, and within a few days the west-end rolling-mill plants had also resumed production. The company had agreed to collect

53. *Spectator*, 1 April 1910; Brody, *Steelworkers*, pp. 132-40; Hessen, "Bethlehem Steel Strike."
54. *Herald*, 1-2 April 1910; *Times*, 2 April 1910.

information on wage rates in the Buffalo steel industry and to fire two foremen who had been accused of extorting money from the immigrant labourers for the privilege of working in their gang. Ten days later the firm announced an elaborate new wage scale with increases of 5 to 10 per cent. In this short-lived eruption of anger — the most serious disruption of the company's production in the whole half-century before the 1946 steel strike — this new element in the Hamilton labour force had effectively challenged, though not eliminated, the company's authoritarian, low-wage policies.

No permanent organization ever appeared during these confrontations, although the role of ethnic societies remains a mystery which the period's English-language press never bothered to probe.[55] In 1919, however, the Hamilton steel industry encountered its first revival of formal unionization in nearly two decades. Having broadened its membership base to include virtually all steelworkers, the Amalgamated Association of Iron, Steel, and Tin Workers had begun an aggressive organizing campaign in the United States in 1918 and established a Hamilton lodge in October 1919.[56] With the relatively skilled men from the Steel Company's new sheet mill as a backbone, membership quickly reached thirteen hundred. For the first time unity was growing across ethnic divisions. Even though the elaborate ritual and passwords of the Association's meetings may have confused the European workers, the union's organizer was able to report considerable success in recruiting "the foreign element in and around the various steel plants of the city." The company fought back with new efforts to promote corporate loyalty and employee welfare: wage increases, a new pension plan, and a new company magazine. But it was the severe depression of the early 1920s which effectively crippled this first attempt at industrial unionism before any strikes or significant negotiations took place.[57] Not until the return of full employment and a more sympathetic attitude from the state during World War II

55. It is perhaps significant that the city's first ethnic fraternal society, the First Italian Society of Hamilton, was organized on 30 June 1910, in the wake of the great strike. The Poles organized two years later into the Society of St. Stanislaus Kostka, in 1913 into a "nest" of the Polish Falcons Alliance, and in 1915 into a branch of the Sons of Poland. In 1911 a Hamilton edition of a Buffalo Polish newspaper and in 1912-13 a local Italian paper, *L'Italia Di Hamilton*, circulated in the city; unfortunately, no copies have survived. Ontario, Inspector of Insurance, *Report* (Toronto, 1911), C248; William Boleslaus Makowski, *History and Integration of Poles in Canada* (Lindsay, 1967), pp. 75-76; Joseph A. Wyrtwal, *Behold! The Polish Americans* (Detroit, 1977), pp. 102-3 and 161; *Spectator*, 12 December 1910; *Herald*, 20 September 1913; *Labor News*, 6 March 1914; *City of Hamilton Directory* (Hamilton, 1914), p. 799.

56. Jesse E. Robinson, *The Amalgamated Association of Iron, Steel, and Tin Workers* (Baltimore, 1920); Brody, *Steelworkers*, pp. 214-46; and *Labor in Crisis: The Steel Strike of 1919* (Philadelphia, 1965); *Amalgamated Journal*, XXI, no. 5 (16 October 1919), pp. 3 and 31; *Spectator*, 24 and 29 September 1919.

57. *Amalgamated Journal*, XXI, no. 13 (11 December 1919), p. 8; XXI, no. 44 (15 July 1920), p. 24; XXII, no. 17 (17 February 1921), p. 20; *Labor News*, 20 February, 25 June, 30 September and 9 December 1920; M.T. Montgomery, "Stelco Story", United Steelworkers of America, *Information*, August-September 1954, p. 5; McMaster University Archives, M.T. Montgomery Papers, Interview; Steel Company of Canada, *Annual Report*, 1919, n.p.; Canada, Department of Labour, *Labour Organization in Canada* (Ottawa), 1924, p. 250; 1925, p. 254; Robertson Papers, "Notes from Conversations."

would Hamilton's steelworkers be able to present a powerful collective front to their employer.[58]

What had prompted this first experiment in industrial unionism among Hamilton's steelworkers? The war had been the chief disruptive force in work relations in this and so many other industries. Not only did it generate discontent with rising living costs, profiteering, and government mismanagement and at the same time unleash a powerful new rhetoric of democracy and public service, but it also provided full employment at high wages, giving Hamilton workers a more secure economic base from which to struggle for better living and working conditions. A resurgence of craft unionism and the first efforts at industrial unionism in textiles, clothing, meatpacking, metal-working, and steel were matched by the new triumphs of the city's Independent Labour Party in 1919.[59] The war had a special impact on Hamilton's European immigrant community. Movement across the Atlantic was curtailed, and, while mobility across the continent continued, the new job opportunities for Europeans in the steel plants must have encouraged more of them into a more settled position in the city.[60] Moreover, the Russian Revolution had inspired a new militancy and radicalism among some ethnic groups, especially Russians and Ukrainians, and it was undoubtedly the oratory of these radicals at the steelworkers' organizational meeting which led a visiting Montreal organizer to express surprise that "the soviet idea was so rampant here among the foreign-speaking iron and steel workers."[61] The cutting edge of activism among Hamilton's steelworkers, however, came from the relatively skilled rolling-mill hands in the Steel Company's new sheet mill plant, where technological change had been minimal and where manual labour was still essential. These men, imported by the company along with the new machinery, transplanted their considerable union experience to Hamilton soil and would form the core of renewed industrial-unionist efforts in the 1930s.[62]

We might wonder too about the long-term impact of changing job structures which made an industrial-unionist experiment possible by 1919. In earlier decades craftsmen had approached industry from the autonomous realm of their skilled trades, while labourers had been tangential to all industries, moving frequently between jobs and cities. Though hard evidence is lacking, it might be argued that the new work force in steel plants, filling the new specialized, semi-skilled jobs, were beginning to identify themselves as *steelworkers*, with distinct experience and steadier commitment to a specific industry in a specific community. Certainly more workers had now accumulated experience in mass-production plants, notably in the munitions industry, and the pre-war pattern of wide-ranging work experience which combined factory work with outdoor construction or agricultural work was giving way to more regular factory employment. Perhaps the reshaping of the work process and the workers' growing familiarity with the new workplace rhythms were gradually creating a more

58. See Storey, "Workers, Unions, and Steel", pp. 297-418.
59. See W. Craig Heron, "Working-Class Hamilton, 1895-1930", (Ph.D. thesis, Dalhousie University, 1981), pp. 619-49.
60. *Herald*, 8, 11 January, 25 April and 30 July 1917.
61. *Labor News*, 30 September 1920.
62. Storey, "Workers, Unions, and Steel."

cohesive, more self-conscious work force. It was certainly becoming more settled; in 1935 the Steel Company was able to report that 88 per cent of its employees had been with the company at least five years.[63] The stability which the Steel Company was trying to promote among its more skilled workers could thus become a double-edged phenomenon: under normal circumstances, a quiescence among steelworkers dependent on the company for their livelihood and for any advancement; or, under such exceptional circumstances as World War I and its immediate aftermath, which dispelled the fear of poverty and tarnished the legitimacy of capitalist control, a stubborn militancy from this increasingly entrenched work force. Such a dynamic within the consciousness of Hamilton steelworkers could only be in the formative stages by the end of World War I, but in the special conditions of the next World War it could translate into successful industrial unionism.

In general, the collective activity of Hamilton's steelworkers in the early twentieth century did little to change fundamentally the distribution of power between workers and managers in the industry. Concerted working-class protest in the steel plants periodically brought slightly higher wages for a time, but the technological and managerial innovations which had created the distinctive work relations were never seriously threatened. The absence of any significant body of craftsmen with a wider perspective on the whole industry deprived the steelworkers of the kind of articulate critics of industrial transformation which could be found in foundries or machine shops, in print shops, or in the needle trades in the same period. The combination of a powerful and doggedly anti-union employer and ethnically stratified work force further reduced the ability of Hamilton's steelworkers to act together. Their individual patterns of resistance, whether slowing down on the job or quitting altogether, probably created a greater impact, resulting in technological changes which attempted to circumvent this element of unpredictability in the production process.

III

Mass production thus came to the Hamilton steel industry as a result of two convergent social processes: the struggle of the owners and managers of the Steel Company of Canada and its predecessors to maintain a profit-making enterprise in the face of stiff American competition, and the migration of thousands of southern and eastern European peasants to North America in search of short-term employment. The standards of economical production set by the American steelmakers dictated the form that Canadian steel mills would have to take, and the availability of this new pool of labour allowed the Hamilton steelmasters to administer their plants and alter work routines with greater freedom than they might have enjoyed with a more settled, Anglo-Canadian work force (such as British steel men confronted in this period).[64]

By the 1920s the Hamilton steel industry had passed through its formative phase. At its core was a large, powerful corporation presiding over a fully integrated system of

63. Steel Company of Canada, Ltd., *The Twenty Fifth Milestone, 1910-1935: A Brief History of Stelco* (Hamilton, 1935), p. 54.

64. See Bernard Elbaum and Frank Wilkinson, "Industrial Relations and Uneven Development: A Comparative Study of the American and British Steel Industries", *Cambridge Journal of Economics*, 1979, no. 3, pp. 293-302.

production, from mining to nuts and bolts. Its technology had reached the perfection of a "gigantic automaton" and would change little over the next four decades. Its work force had also stabilized considerably from the pre-war days. Labour turnover would continue to be a problem for Steel Company managers, but a substantial group of steelworkers had settled down in the industry, with some commitment to their semi-skilled jobs.

The process of reaching this equilibrium had been harsh and turbulent. Raw industrial recruits with no experience had passed through the new industrial environment of the steel plants in huge numbers, looking only for quick earnings. The casualness of so many steelworkers' approach to their jobs evident in absenteeism and labour turnover indicated an ingrained resistance to the new rhythms of mass-production work. Wanderlust, however, did not prevent these men from turning into militant strikers whenever they sensed the opportunity to challenge their employer's labour policies. World War I was a catalyst in solidifying this spirit of resistance. By the end of the war the men in these plants were uniting across occupational and ethnic divisions to create the first spectre of industrial unionism — the first indication that a considerable number of steelworkers had begun to share a sense of common identity.

Hamilton's steelworkers, it seems, would not accept without question the terms of employment offered them in speeded-up, rigidly supervised, narrowly specialized jobs. Unlike many craftsmen in the metal trades, they never contested the fundamentals of workplace organization and authority — indeed, mass-production workers seldom did in the 20th century — but their actions in pursuit of better remuneration for their work suggested that the administration of steel plants had to be altered to take account of their material needs as well as of profit margins. Only then could these workers begin to share in the benefits which mass production was supposed to bring to Canadian society.

Appendix I:
Annual Output Per Man in the Blast Furnace Department of the Steel Company of Canada 1897-1920

	Employees	Tonnage	Tons Per Man
1897	130	26,115	200.88
1898	130	48,254	371.18
1899	160	51,739	323.37
1900	160	49,197	307.48
1901	145	67,512	421.95
1902	160	69,123	432.02
1903	180	43,152	239.73
1904	225	66,007	293.36
1905	210	73,408	349.56
1906	220	79,015	359.16
1907	450	89,554	199.01
1908	291	116,805	401.39
1909	372	164,929	443.38
1910	150	162,903	1,086.02
1911	420	175,706	418.38
1912	171	174,082	1,018.02
1913	230	180,712	785.70
1914	230	127,756	555.46
1915	225	165,870	737.2
1916	153	194,863	1,273.61
1917	165	204,228	1,237.76
1918	185	193,357	1,045.17
1919	145	190,251	1,312.08
1920	178	185,639	1,042.91

SOURCE: Public Archives of Canada (hereafter PAC), Mineral Resources Branch, RG 87, vol. 18, file 82. Tonnage-per-man calculations are mine.

APPENDIX II:
Annual Output Per Man in the Open-Hearth Department of the Steel Company of Canada, 1901-20

	Employees	Tonnage	Tons Per Man
1901	95	14,470	152.3
1902	75	18,921	252.3
1903	130	15,386	118.4
1904	115	11,619	101.0
1907	200	61,982	309.9
1908	109	37,662	345.5
1909	163	76,785	471.1
1910	200	90,353	451.8
1918	380	305,001	802.6
1919	300	289,923	966.4
1920	365	301,050	824.8

SOURCE: PAC, Mineral Resources Branch, RG 87, vol. 18, file 82. Statistics for 1905-6 are not available, and between 1911 and 1917, statistics for open-hearth and rolling mill production were combined. After 1903 tonnage figures include insignificant quantities of foundry castings (less than 1 per cent). Tonnage-per-man calculations are mine.

Appendix III:
Wages as a Percentage of the Value of Production at the Steel Company of Canada, 1904-20

	Blast Furnace	Open Hearth
1904	16.35%	20.0%
1905	11.67	n.a.
1906	10.37	n.a.
1907	8.80	18.1
1908	11.05	12.5
1909	9.48	8.0
1910	9.63	n.a.
1911	11.76	n.a.
1912	6.42	n.a.
1913	5.53	n.a.
1914	5.39	n.a.
1915	5.82	n.a.
1916	6.26	n.a.
1917	6.67	n.a.
1918	4.64	5.6
1919	5.53	5.1
1920	4.23	n.a.

SOURCE: PAC, Mineral Resources Branch, RG 87, vol. 18, file 82. Calculations are mine.

Appendix IV:
Accidents in the Hamilton Plants of the Steel Company of Canada and Its Predecessors Requiring At Least Six Days Off Work, 1896-1916

1896	6	1907	68
1897	2	1908	61
1898	4	1909	70
1899	16	1910	84
1900	19	1911	48
1901	5	1912	113
1902	5	1913	122
1903	1	1914	130
1904	9	1915	230
1905	2	1916	488
1906	17		

SOURCE: Ontario, Inspectors of Factories, *Reports* (Toronto), 1896-1916. Tabulations are mine. Detailed breakdowns were no longer published in the factory inspectors' reports after 1916.