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TECHNOLOGY AND CANADIAN PRINTING: A HISTORY FROM LEAD TYPE TO LASERS

Bryan Dewalt

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Technology and Canadian Printing: A History from Lead Type to Lasers

Bryan Dewalt

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Contents

Abstract

As a communication medium, printing has played a major role in the transformation of Canada. Politically it has served as a tool of government and as a forum for political debate. Economically it has been employed for product marketing, administration, and the exchange of information. Culturally it has been the direct and indirect means by which Canadians have contested and defined the nature of their society. As a manufacturing process operating within a capitalist economy, printing has evolved as a diverse industry whose geographic and corporate structure has been simultaneously dispersed (many small firms, widely distributed) and concentrated (a few large firms with specialized plants dominating output). Like other manufacturing processes, printing has been subject to constant technological change. Technology has been used to improve performance in labour productivity and unit cost, speed and volume, flexibility, and product quality. Improvements in presses, typesetting, and image reproduction have been achieved by innovations in mechanics, photography and chemistry, and most recently by advances in electronics and computers. This report is a survey of the evolution of the printing industry in Canada, with a detailed description of these technological changes.

Résumé

En tant que moyen de communication, l'imprimerie a joué un rôle majeur dans la transformation du Canada. Sur le plan politique, elle a servi d'outil au gouvernement et de forum pour les débats. Sur le plan économique, elle a été employée à la commercialisation des produits, à l'administration et aux échanges d'information. Sur le plan culturel, elle a été, directement et indirectement, le moyen par lequel les Canadiens ont contesté et défini la nature de leur société. En tant que processus de fabrication exploité dans une économie capitaliste, l'imprimerie a évolué pour devenir une industrie diverse dont la structure géographique et corporative s'est à la fois dispersée (nombreuses petites entreprises, largement réparties) et concentrée (quelques grandes firmes disposant d'usines spécialisées à possibilités dominantes). Tout comme d'autres processus de fabrication, l'imprimerie a constamment subi des changements techniques. La technologie a été utilisée pour améliorer la productivité de la main d'oeuvre et réduire les coûts unitaires. Elle a permis des gains en vitesse et en volume, et accru la souplesse d'emploi et la qualité des produits. Les perfectionnements apportés aux presses, aux composeuses et à la reproduction des images ont été obtenus grâce aux innovations dans les domaines de la mécanique, de la photographie et de la chimie ainsi que, très récemment, dans ceux de l'électronique et de l'informatique. Ce rapport passe en revue l'évolution de l'imprimerie au Canada et décrit en détail ces changements techniques.

Foreword

In recent years, a number of histories related to printing in Canada have been published—for example, Sally Zerker's *Rise and Fall of the Toronto Typographical Union* (1982) and George Parker's *Beginnings of the Book Trade in Canada* (1985). While these recent histories are important additions to an earlier literature, which dealt primarily with personalities and imprints, few have provided a synthetic overview of Canada's printing heritage or have dealt in a sustained manner with the role of technology within the history of Canadian printing.

The research presented in this paper was undertaken as an "historical assessment" for the graphic arts curatorial section of the Museum. Guided by an intellectual framework, "The Transformation of Canada,"[1] the paper was required to deal effectively with the development of technology in the Canadian context, its application and impact on society.

The work of Bryan Dewalt, a historical researcher at the National Museum of Science and Technology, draws from both primary and secondary sources to tell a story of the birth and growth of Canada's commercial-printing industry. His extensive use of Canadian trade journals provides new knowledge and perspectives, integrating both the persistence and progess of technology with the social, political and economic trends of Canadian history. This synthesis of developments and ideas, covering nearly 250 years of Canadian printing history, will serve not only to establish a basis for the development of a national collection of printing technology but, it is hoped, will also provide students of Canadian history with an important reference point for further research in the field.

Geoffrey Rider
Curator – Graphic Arts

1. Readers interested in obtaining further information on this framework should contact the Collection and Research Branch of the Museum (address on inside front cover).

Avant-propos

Ces dernières années ont vu paraître un certain nombre d'ouvrages d'histoire sur l'imprimerie au Canada, par exemple *L'avènement de la linotype : ...* (1992), de B. Dansereau, et *La presse québécoise de 1884 à 1914* (1988), de J. de Bonville. Si des éléments importants sont venus s'ajouter aux écrits antérieurs qui portaient principalement sur des personnalités et des imprimés (*L'introduction de l'imprimerie au Canada* [1929, 1957], de A. Fauteux), peu ont donné un aperçu synthétique du patrimoine canadien en matière d'imprimerie ou ont abordé le rôle de la technologie dans ce domaine.

Le travail de recherche présenté dans ce document est une «évaluation historique» réalisée pour la section de la conservation des arts graphiques du Musée. Guidé par le thème central de «La transformation du Canada»[1], le document devait traiter du développement de la technologie dans le contexte canadien, de son application et de ses répercussions sur la société.

Le travail de Bryan Dewalt, historien recherchiste au Musée national des sciences et de la technologie, s'appuie sur des sources primaires et secondaires pour raconter l'histoire de la naissance et de l'expansion de l'imprimerie commerciale au Canada. Son utilisation intensive des revues professionnelles canadiennes lui permet d'apporter des connaissances et des perspectives nouvelles qui intègrent la persistance et les progrès de la technologie aux tendances sociales, politiques et économiques de l'histoire du Canada. Cette synthèse des développements et des idées, couvrant presque 250 ans d'histoire de l'imprimerie au Canada, servira non seulement de fondement à la constitution d'une collection nationale sur la technologie de l'imprimerie mais, nous l'espérons, offrira aussi aux étudiants en histoire du Canada un point de référence important pour poursuivre les recherches dans le domaine.

Le conservateur responsable du secteur des arts graphiques,
Geoffrey Rider

1. Les personnes intéressées à en savoir plus à ce sujet peuvent communiquer avec la Direction de la collection et de la recherche du Musée (voir adresse en deuxième de couverture).

Introduction

Printing is a communication system that, in its common physical form, creates multiple copies of text and pictures by the application of ink to paper from a plate or assembled types. It has been associated since the reinvention of moveable type in the West with major social changes, from the dissemination of humanistic and liberal ideas of the Renaissance and Enlightenment, to the rise of industrial capitalism in the 19th century, and the diffusion of popular culture and consumer products in the 20th century. Its introduction has also, in its own right, been characterized as a landmark step in mechanizing and routinizing human industry. This tendency has been repeatedly affirmed since the dawn of the 19th century in the constant technical development and economic rationalization that has marked "the art preservative of all arts." No less than elsewhere, this story has been played out in Canada. And the lines of its development parallel others in this country's social and economic history.

By the time it was introduced to Canada in 1751, printing was already three hundred years old, and the transplanted European culture that was emerging here had already been affected by it. The literature on the impact of printing on society and thought is extensive and requires no detailed discussion here. However, to orient the study that follows, I will refer to several important texts. First, this study is part of a larger historical enterprise at the National Museum of Science and Technology to document the "Transformation of Canada" through the application of science and technology.[1] This theme reflects an institutional commitment to the notion that discovery and innovation originate and are applied within a fluid social context. They emerge in specific historical circumstances, and are shaped by the actions of individuals and groups. In this process, however, social practices and structures evolve around new technologies, with further social changes emanating from these. When we attempt to construct histories, technologies appear both as human inventions and as seemingly autonomous systems, agents of change in their own right.[2]

Printing is a communication technology and, as such, has played a critical role in the evolution of our society. The reason communications systems have been so central is that language is the process by which we, collectively, create our world. It is impossible to determine the nature of the world outside of the stories, arguments, and theories we make about it.[3] It follows then, that the means by which we carry on communication will influence the ongoing process of defining and redefining the only reality we can ever know. Canadians have long been aware of this as the struggle to develop indigenous forms of expression that will define a national "spirit" distinct from the imperial spirits established in London and New York (or Hollywood). On a more prosaic level, the struggle to develop indigenous lines of communication reflects the desire to define an independent economic and political space in which Canadians may control exchanges in goods, information and money and carry on our own, often competing, discourses about how society should work.

Any attempt to understand the relationship between communications and society must begin

1. National Museum of Science and Technology, *Collection Development and Management Plan, 1989–1995* (Ottawa, 1989).

2. "Introductory Essay," in Donald MacKenzie and Judy Wajcman, eds., *The Social Shaping of Technology: How the refrigerator got its hum* (Milton Keynes, U.K.: Open University Press, 1985), pp. 2–25. For a discussion of technologies as both social objects and historical subjects see: Langdon Winner, "Do artifacts have politics?" in MacKenzie and Wajman, pp. 26–38.

3. For an elaboration of this point, see Richard Rorty, *Contingency, Irony, and Solidarity* (Cambridge, U.K.: Cambridge University Press, 1989), pp. 3–22. For its application to the study of communications, see James W. Carey, *Communication as Culture: Essays on Media and Society* (New York: Routledge, 1989), pp. 13–88.

with the work of Canadian economic historian Harold Innis. For Innis, social change, communication media, and political power were intertwined. He proposed that communication media tended to either bind societies through time (as by tradition or religion) or to extend their influence through space (by the rapid transmission of messages). Modern media like newspapers, radio and television, were space oriented. Local societies that had achieved stability and cohesion through an oral tradition gave way to expansionary political and commercial empires dominated by elites extending power by the new media. This process was played out in social conflict as new space-binding media were introduced, acquired disproportionate influence, and became monopolized by a knowledge elite.[4]

Innis's dichotomy of space and time-binding media has been recast by James W. Carey into two rival conceptions of how we should study communications. Long dominant has been the transmission view, that communication is essentially the process of sending messages through space for the purpose of control. Governors dispatch orders. Financiers place orders. Advertisers influence buyers. Everyone gathers information. The rival conception, which for a long time has been neglected, is that communication is linked (by common etymology) to notions of "commonness," "community," and "communion." In this "ritual" view of the matter, communications is "a process through which a shared culture is created, modified, and transformed."[5]

In the study that follows I have tried to look at printing from both perspectives, though the transmission view may seem to have received more emphasis than the ritual. The energy devoted in Canada to printing business forms, catalogues and flyers, packaging and commercial newspapers has far surpassed conscious efforts to use print for the creation of a common culture. As Mary Vipond has argued in The Mass Media in Canada, the history of communication technologies since the invention of print has been intertwined with the development of modern capitalist economies. In Canada the print and other media have evolved as private enterprises run for profit, and through such forces as advertising, for the profit of others. But however limited the intent, by pervading our daily conversations, by imposing their vocabularies and priorities, communication media have largely produced our culture. When the profit motive has resulted in cultural effects undesirable to some—the monopolization of newspapers, the triumph of consumerism, the overwhelming influence of American books or magazines—then economic forces have become cultural problems. Hence the ongoing struggle of Canadian publishing runs as a secondary theme throughout this study of Canadian printing. For just as printing helped transform Canadian economic and social life, so too it was enlisted as both unifying force and agent of diversity within an ongoing culture struggle.[6]

But this study will be far more than a social history of printing in Canada. In addition to being a cultural force, printing is also a manufacturing process applied within a capitalist economy. It is a system comprising many tools, machines, techniques and forms of organization that has evolved within thousands of firms grappling with everyday questions of unit cost, deadlines, and output per worker. Changes in actual technology, from hand press to ink jet, from letterpress to lithography, from metal type to digital, have had a profound impact on the ability of the printing industry to carry out its social functions. This study will therefore address the details of mechanics and electronics, optics and chemistry as they have applied to changes in print technology. The technological sections of each chapter, in fact, compose the bulk of this report. This reflects both the multitude of innovations that mark the long history of printing in Canada and the function of this research report as an aid to the National Museum of Science and Technology in managing and developing its collection of artifacts.

The study will be divided into four periods. As an introduction to each, I will briefly discuss the Canadian historical context, outlining those factors with direct relevance to printing: for example, the early evolution of government; the spread of settlement; increases in population and the transition from a rural to an urban society; industrialization; development of public eduction and a mass reading public; the rise of packaged

4. Harold Innis, *The Bias of Communication* (Toronto: University of Toronto Press, 1951), pp. 3–4, 31–4, 64, 76–82.
5. Carey, pp. 14–19; quote on p. 43.
6. Mary Vipond, *The Mass Media in Canada* (Toronto: Lorimer, 1989), pp. ix–xii, 71–73, 94–106.

consumer products and advertising. In addition, I will study in each period trends within the printing industry as a whole, both changes in overall output and also changes in the structure of the industry. On the technological level, I will discuss the current and new press and pre-press technologies of a period and the types of products they were used to produce. And because production ultimately depends on the application of human labour, I will then address the related issues of the labour process and labour relations. The issues of how work was organized and performed, the skills and attitudes of the workers who did it, and their relations with the owners of their tools, are critical aspects of technology.

Clearly, a chronology suggests discrete technological periods with absolute beginnings and endings. But certain techniques and machines were not widely used for years after their invention. Similarly, technologies with incremental improvements persisted in use, indeed dominated the trade, for a long time even after more advanced systems began to be adopted. In this report I will attempt to deal with each printing technology during the core period in which it was adopted and reached peak use in Canada. In doing so I will naturally refer to earlier periods when the technology was first developed. Similarly, in later periods I will refer to the persistence of older technology, though only in the context of emerging technologies.

Chapter 1. 1751–1880 – The first period begins with the hand press, hand composition, the small, often government-subsidized shop, and a sparsely populated frontier society with low literacy levels and a small reading public. By the time the period ends in 1880, printing had spread across the Dominion. In the east, industrialization, public education, and the development of cities and large towns encouraged the publication of some books and of large-circulation daily newspapers. It also saw the rise of an industrial printing industry centred on Montreal and Toronto. Steam powered cylinder presses increased speed and output of newspapers, directories and a few books, and smaller job work was facilitated by the job platen press. The techniques of stereotyping and electrotyping produced plates that enabled printing forms to be duplicated without resetting of type and images. For the first time also, type was manufactured in Canada. By the end of the period illustration printing became firmly established as separate trades in wood and metal plate engraving and in lithography. Workers in letterpress printing led in this period in the formation of Canada's first and most successful labour unions.

Chapter 2. 1880–1920 – Developments in printing technology were numerous in this key period. Large, steam-powered, roll-fed rotary presses allowed for the increase in speed and volume of print shops. Typesetting was revolutionized by the widespread introduction of keyboard-operated composing machines in the 1890s. Widespread adoption of line and halftone photoengraving made possible the cheap and rapid reproduction of all manner of visual material. A packaging industry relying on colour lithography was born to capture new markets produced by urbanization and industrialization.

Industrially, this period was marked by a huge increase in printed output and the size of the market, and by the rise of large, capital-intensive printing and graphic arts companies. Large numbers were employed in the industry. New specialized trades were evolving with the technology and a growing craft distinction was made among them. Among these highly skilled workers, artisanal traditions and modern forms of craft union organization coexisted successfully. At the peak of their historic power, printing trade unions successfully challenged and accommodated the introduction of new technologies to ensure the security of their members while allowing great increases in volume and productivity.

Chapter 3. 1920–1960 – During this period hot metal composition and letterpress printing reached its apex. One important theme was continuing mechanization and automation. In presswork this included the final shift from hand-fed to machine-fed presses. Composition was further automated by the use of punched paper tape for input to type casters. But signs of a technological revolution were developing. The adoption of offset printing and photographic methods greatly expanded the commercial applications of lithography. To complement offset photolithography, new strike-on and phototypesetting technologies were developed to by-pass metal type composition entirely. In addition, rotogravure, screen printing, and flexography were developed to serve the rapidly expanding package, label and advertising fields. This reflected the continuing industrialization and urbanization of Canada and the

expansion of markets for processed foods and other packaged consumer goods.

Chapter 4. 1960-1990 – The final period was marked by the obsolescence of hot metal typography and letterpress technology. Offset photolithography became the standard for mass-produced printed material. Text composition was transformed by computerized phototypesetting, and page design and make-up revolutionized by personal computers and graphics software. The fields of image reproduction and platemaking were changed by the introduction of electronic scanning in place of photographic techniques. A major development in presses was the introduction of electronic and computer controls. By the early 1990s, "waterless" offset and computer-to-plate systems were promising a further change in lithography. The refinement of ink jet and laser printers, meanwhile, suggested fully electronic, flexible alternatives to conventional printing would become increasingly important.

These technological developments caused labour upheaval as traditional job skills, classifications and privileges were eliminated or rewritten. In terms of industrial structure, the availability of xerography (photocopying), personal computers with word processing, page make-up and graphics software, and relatively cheap inkjet and laser printers spawned a large number of small printing and graphic arts companies. At the same time, though, printing became a national and international business, as such firms as Maclean-Hunter, GTC Transcontinental, and Quebecor achieved industry dominance in Canada and expanded abroad.

In the construction of this chronology I have, where possible, relied on primary sources. Due, however, to the limited time within which it was completed, my research rests heavily on two series of records, the industry trade journals, Printer's Miscellany (1876–1882) and Canadian Printer and Publisher (1892–present). For temporal breadth and wealth of detail, these monthly periodicals are more useful than any other single primary source. Because they were used by Canadian printers to keep abreast of technical developments, they provide the historian with reports on a new machine or process as it first came to the attention of the industry. They also furnish valuable information about the diffusion of these innovations, through product advertisements, descriptions of new or notable printing plants, and reports of orders and deliveries to firms. Moreover, by reporting on general trade conditions, the fortunes of individual firms, and the preoccupations of trade associations, they provide a historical context for this technical chronology. But the trade journal itself was not a neutral reporter. It was an active promoter of innovation, redefining practices within the trade. Canadian Printer and Publisher, whose existence depended on a prosperous trade that purchased the technology it advertised, was tireless in redefining printing as a sophisticated business where the old craft rules of thumb were obsolete; craft experience must be subordinated to efficiencies embodied in machines. Tradè journals were not simply witnesses to the transformation of Canadian printing, they rode in the vanguard. In a study of technological change, this enhances, rather than diminishes their value as sources.[7]

Though from time to time I cite other primary sources, I can make no pretense at an exhaustive study based on all available documents. My account reflects the strengths and weaknesses of a reconnaissance survey. It is hoped that as the first, this study will stimulate further explorations by others, both to discover new sources of information and to revise the narrative I propose.

7. It would be dangerous to assume, however, that most printers actually ran their businesses according to methods recommended by the trade journal. Frequent exhortations regarding price and cost systems, for example, may well indicate the failure rather than the success of the editors' efforts. For an interesting analysis of the role of one trade journal see: Keith Walden, "Speaking Modern: Language, Culture, and Hegemony in Grocery Window Displays, 1887–1920," in *Canadian Historical Review*, 70,3 (Sept. 1989).

1 From Workshop to Factory, 1751–1880

Part 1 – Printing and Canadian Society, 1751–1880

Printing in Canada began, much like the settlement of the country itself, as a sporadic and scattered enterprise that was commercially precarious and largely reliant on imperial or colonial governments for protection and sustenance. And again following the course of the country, its unpromising beginnings eventually gave way, with increased settlement and an emerging, industrial economy, to a nascent but sophisticated industry. As the reading public increased and took a greater interest in commercial and public affairs, printing came to play a major role in the transformation of the pioneer colonies of British North America into a self-governing, economically dynamic Dominion. This increasing importance of printing was accompanied by the introduction of important new technologies.

The printing trade in Canada before 1812 was a creature of government, which saw it as a necessary, though sometimes unreliable, instrument of British colonial administration. The first printing office in a colony followed closely on the establishment of British government and, outside the St. Lawrence valley, even preceded the formation of a stable, well-developed society.[8] Bartholomew Green arrived in Halifax in 1751, just two years after its founding as a military outpost and capital of Nova Scotia. Though he died before printing anything, his successor, John Bushell, produced in 1752 the first imprints in what is now Canada. William Brown and his partner Thomas Gilmore also followed the path of British troops, setting up shop in Quebec City in 1764, a year after the Treaty of Paris ceded Canada to Britain. In most cases, an appointment as King's Printer or at least a contract to print government work was a necessity for pioneer printers. This had also been the case in the older American colonies to the south. In addition to the Halifax and Quebec offices, the Loyalist printers establishing shops in the new Maritime colonies of New Brunswick and Prince Edward Island in the 1780s, John Ryan, Christopher Sower, and Alexander and James Robertson, all subsisted largely on government work. Louis Roy, first printer in Upper Canada, was actually recruited by John Graves Simcoe, who as the colony's first Lieutenant-Governor had written to the British Government that a printer would be "indispensably necessary" for promoting settlement, communication, and trade.[9]

Just nine printing offices existed in British North America in 1800, serving a population of about 350,000 scattered over a distance of 2400 km between Newfoundland and the Detroit River. While London merchants and their colonial associates carried on a limited export trade in fur and fish, the vast majority of people lived outside this trans-Atlantic nexus in isolated, self-sufficient farming settlements. No town had more than 8,000 inhabitants, the largest being Halifax, Quebec and Montreal.[10]

The War of 1812 and the end of the Napoleonic Wars in 1815 brought a major change to the course of development in Britain's North American colonies and provided the context for an expanded role for printing. Post-war

8. Though printed matter had circulated in New France, there had apparently been no printing press in Canada under the French regime.

9. Marie Tremaine, *Canadian Book of Printing* (Toronto: Toronto Public Libraries, 1940), pp. 16–56; Marie Tremaine, *A Bibliography of Canadian Imprints, 1751–1800* (Toronto: University of Toronto Press, 1952), pp. xi, 661–69; H. Pearson Gundy, *Early Printers and Printing in the Canadas*, (Toronto: Bibliographical Society of Canada, 1957), pp. 2–20; William Colgate, "Louis Roy: First Printer in Upper Canada," *Ontario History*, 43,3 (July 1951), p. 123; Lawrence C. Wroth, *The Colonial Printer* (Charlottesville, VA: University Press of Virginia, 1964), p. 14.

10. Tremaine, *Bibliography*, p. xi; R. Cole Harris, ed. *Historical Atlas of Canada*, Vol. 1 (Toronto: University of Toronto Press, 1987), pp. 171–76.

economic distress and political repression in Britain, which lasted over a generation, caused a steady stream of immigration from Ireland, Scotland and England. The immigrants' capital, spent in local markets, and their labours on the land stimulated local economic activity. British mercantilist economic policies giving preference to colonial commodities and shipping encouraged the development of a timber and wheat export trade in Upper and Lower Canada. Wheat profits, especially in Upper Canada, were reinvested in non-agricultural sectors, promoting limited diversification. And towns like Brantford and London developed as shipping and supply centres. The established shipbuilding, timber, fish, and West Indies shipping trade in the Maritimes continued to grow after 1815. In all colonies blacksmiths, saddlers and other artisans began a limited manufacture for local markets. Spurred by ambitious merchants, canals were built in the 1820s to channel internal trade through the St. Lawrence River system and away from the United States.[11]

If for no other reason than population increase, the demand for printing, and hence the growth of a printing industry, was bound to increase. But other social factors at work, especially after 1815 and increasingly in the 1820s and 1830s, also encouraged such growth. The first factor was the increase in commercial activity, both related to the international staple trade and to the exchange of commodities and goods for domestic consumption as the pioneer communities began to realize surpluses above the subsistence level. The second was the struggle against entrenched and privileged government and religious elites and the agitation for responsible government and other reforms. While increased commercial activity called for more printed advertising and generated funds to be spent on reading matter, political ferment found a forum in the increasing number of newspapers and polemical pamphlets. Central to both processes was the emergence of a local middle class with a stake in the growth and prosperity of the colony.

The years between 1840 and 1880 saw substantial political developments, responsible government, Confederation, and the expansion of territory and incorporation of new provinces. But the period was also marked by a major economic shift from trans-Atlantic commodity trade to internal development and exchange. In the 1840s the end of colonial preference on resource commodities deprived British North America of its competitive advantage in the Old Country. The Maritimes, with their increasingly successful role in timber ship building and Atlantic shipping were least affected by this change. In the Canadas, however, merchants were required to reorient their thinking toward internal and American markets. Part of this process was the bulding of railways which, with construction of the Great Western and the Grand Trunk in the 1850s, boomed even beyond the capacity of the colonies to support them. One concomitant of the railways was industrialization. The new roads integrated heretofore small isolated markets. They also became customers for industrial goods and became manufacturers of rolling stock and rails themselves. Other manufactures also increased. In Canada East/Quebec a plentiful local supply of labour and capital encouraged boot and shoe production and heavy manufacturing in a few centres: Montreal, Sherbrooke, Trois Rivières. In Canada West/Ontario industry was more dispersed and less intensive. Hamilton and Toronto were the largest manufacturing centres, but numerous towns also had some industry.[12]

The period was one of urbanization, the growth of large industrial cities like Montreal, Toronto, Saint John, and Hamilton and, equally importantly, the rise of many towns. In this period a high birthrate and the shortage of agricultural land led to chronic population surplus in rural areas. In addition to out-migration to the United States and Manitoba, this led to migration to towns. Between 1850 and 1870 the number of Ontario towns between 1000 and 5000 population more than doubled from 33 to 69. In this period Canadian society was marked in general by a high degree of transiency. Just as urbanization and economic development were to stimulate printing business, rural overpopulation and general transiency was to have implications for the printing trade.[13]

In addition to economic, political and demographic factors, a further influence on the growth of printing in the 19th century was increasing literacy. As one scholar has written, reading in the late 18th and early 19th centuries was large-

11. J. M. Bumsted, *The Peoples of Canada: A Pre-Confederation History* (Toronto: Oxford University Press, 1992), pp. 186–215.

12. Ibid., pp. 280–302.
13. Ibid., pp. 238–349.

ly an "élite preoccupation" enjoyed by "government servants, garrison officers, the clergy, teachers, merchants and ladies." The taste of this small and often transient group for books was almost fully satisfied with imports from England and France. Reliable and comprehensive figures on popular literacy do not exist, but anecdotal evidence testifies to a great degree of illiteracy in the latter half of the 18th century, especially in rural areas.[14]

The first two decades of the 19th century saw the first tentative steps taken toward state-supported elementary and secondary education. Provincial acts providing small grants to local elementary schools were passed in Lower Canada in 1801, New Brunswick in 1802, Nova Scotia in 1808 and Upper Canada in 1816. While amendments to provincial acts in the 1820s and 1830s improved funding and made it easier to establish schools, education remained until the 1840s and 1850s a patchwork of private one-teacher schools, parish, missionary society, and charitable schools, and public non-sectarian schools that only met the needs of a fraction of children.[15]

Also of note were moves toward popular self-education among adults. These began with the distribution of free or inexpensive religious pamphlets, bibles and devotional works by colporteurs and British Protestant tract societies. During the 1820s and 1830s, British North American booksellers began to do a steady business in the import and sale of inexpensive series, or "libraries," of books on the sciences, technology, and other improving and practical subjects. As well, the market for more literary fare was increasingly met by cheap American reprints of expensive British editions.[16]

Educational reforms between 1840 and 1870 established public schooling on a modern foundation, with laws in most provinces establishing government supervision and inspection of schools, the training of teachers in normal schools, and the compulsory levy of local property taxes to help pay education costs. Though the arrangements varied from one province to another, by the 1870s great steps had been taken toward universal and free, but not compulsory, education.[17]

In 1850, before the institution of universal public education, between two thirds and three quarters of Canadian adults could already read. This percentage increased over the following decades with the spread of schooling, despite persistent pockets of illiteracy. Because children's labour was often required to support the family, lower levels of school attendance were found among the rural poor, especially in Quebec, and among the working class. In 1871 more than 92 per cent of Ontario adults could read, compared to about 84 per cent in the Maritimes and 64 percent in Quebec. By 1891 the number of adult readers had increased everywhere, to about 93 per cent in Ontario, 92 per cent in the Maritimes and more than 70 per cent in Quebec.[18]

Before 1840 most printing activity occurred in provincial capitals and other large population centres, where government contracts and/or a large enough population of educated people could be relied upon for regular business. In 1820, the three largest printing centres were, as twenty years earlier, the three most populous towns, Halifax, Montreal and Quebec City. Here, not only printers but related trades like engravers, stationers, booksellers and bookbinders turned out the modest production of books, literary magazines, and pictorial prints that augmented the usual fare of newspapers, pamphlets, and job work.

The most important printing centre was Montreal, which was emerging in this period as the metropolis of an inland commercial empire and entrepôt for European trade. It had seven offices in 1820 in addition to a thriving retail and wholesale book trade. By the 1830s it was the most active centre of engraving and lithography in British North America. And in 1833 the short-lived *Daily Advertiser* became the first daily newspaper in British North America. In the same decade, reflecting the sufficiency of local demand, Montreal became the first British North American city to have a commercial type

14. George L. Parker, *Beginnings of the Book Trade in Canada* (Toronto: University of Toronto Press, 1985), pp. 12, 15, 19–21; J. Donald Wilson, Robert M. Stamp, Louis-Philippe Audet, *Canadian Education: A History* (Scarborough, Ont.: Prentice-Hall, 1970), pp. 148–49.
15. Wilson, Stamp and Audet, pp. 91–95, 99, 107–13, 148–49, 152–59, 194–209.
16. Parker, pp. 19–20, 95–104.
17. Wilson, Stamp, Audet, pp. 101, 114, 117, 121, 134, 179, 187, 214, 218–20, 224–25.
18. Paul Rutherford, *A Victorian Authority: The Daily Press in Late Nineteenth-Century Canada* (Toronto: University of Toronto Press, 1982), pp. 26–31.

foundry. Montreal was to dominate French and English language printing until Confederation. Afterwards it gradually lost ground in English printing to Toronto.

In 1820 the only print shop in York was operated by the King's Printer. Through the 1820s, however, several printing offices associated with the new newspapers were established, and by 1833 the town could count eight print shops, three bookbinders, two booksellers and stationers and a lithographer. The newspaper offices remained the centre of this industry in Toronto until the 1840s, and the output of these shops was considerably less sophisticated than that of the older towns like Montreal, Quebec and Halifax.[19]

One notable phenomenon of the 1820s and 1830s was the spread of the printing press to minor regional towns that were emerging as increasing agricultural settlement and commodity trading gave rise to local market centres. In 1820, a few print shops were distributed among lesser towns like Saint John and Kingston and provincial capitals like York, Charlottetown and Fredericton. But over the next two decades such centres as Pictou and Yarmouth, N.S., Miramichi, N.B., Sherbrooke, L.C., and Brockville, Hamilton, London, Berlin (Kitchener), Bytown (Ottawa), and Peterborough, U.C. acquired printing offices.[20]

In Upper Canada, the growth of printing and its diffusion among many communities continued after 1840. In 1851, 631 printers and 121 book-binders, engravers and lithographers were listed in the census for the united province of Canada. Though the two Canadas had nearly identical populations, two thirds of these workers plied their trades in Upper Canada. Thirty-six of the 47 census districts west of the Ottawa River had at least one printer by trade, and two thirds of print craftsmen lived outside Toronto. This even distribution was not found in Lower Canada, where 30 of 38 districts had no printer and 90 per cent of all print trade workers lived in Quebec City and Montreal. Quebec City, as the temporary seat of government, was the largest of the two printing centres in 1851. But by 1861 it had lost the capital to Ottawa and printing preeminence to Montreal. By this time also more outlying areas listed printers in the census, but the two main cities of Lower Canada continued to dominate in a way not found in Upper Canada.[21]

The period between 1840 and 1880 also marked the introduction of the first printing presses west of the Great Lakes. Invariably, the press was in the vanguard of a new order that overturned the old fur trade and indigenous societies. In 1840 James Evans, a Methodist missionary at Norway House, near the north end of Lake Winnipeg, devised a syllabic Cree alphabet and began printing hymns and devotional works with homemade movable types and, it is said, a common fur press. In 1842 he received from London a proper hand press and professionally cast types. In the 1850s and 1860s, other mission presses were set up at Moose Fort, York Factory and elsewhere.[22]

In Victoria in 1858 gold miners swamped the sleepy Hudson's Bay Company outpost en route to the newly discovered Fraser gold fields. In that same year three newspapers were established of which one, the *British Colonist*, still exists. The following year two presses went into service in the Red River colony, where another Hudson's Bay Company colony was about to crumble. One of these printed the *Nor'Wester*, which was instrumental in the successful Canadian movement to annex Rupertsland. The end of the 1870s was marked by the further spread of the press. At Battleford in 1878 Patrick Laurie, one of the Canadian partisans from Red River, established the Saskatchewan *Herald*. And in 1880 Frank Oliver founded the Edmonton *Bulletin*.[23]

19. Parker, 52, 76–77, 79; Mary Allodi, *Printmaking in Canada: The Earliest Views and Portraits*, Second Printing (Toronto: Royal Ontario Museum, 1980), p. xiii; Elizabeth Hulse, *A Dictionary of Toronto Printers, Publishers, Booksellers and the Allied Trades, 1798–1900* (Toronto: Anson-Cartwright Editions, 1982), pp. x–xi.
20. Parker, pp. 57–58.
21. Canada, *Census* (1851), v.1, pp. xvii, xix, Appendices 7,8; Canada, *Census* (1860–1), v.1 Tables 1,2, Appendices, 7,8.
22. Bruce Peel, "Rossville Mission Press: Press, Prints and Translator," *Papers of the Bibliographical Society of Canada*, 1 (1962), pp. 30, 33; Joyce M. Banks, "Books in Syllabic Characters Printed for the Use of the Church Missionary Society ...: 1852 – 1872" (Ph.D. thesis, University of London, 1988), pp. 90–91.
23. W. H. Kesterton, *A History of Journalism in Canada* (Toronto: McClelland & Stewart, 1967), pp. 30–31; Tremaine, *Canadian*, pp. 58–65; Parker, 142–46; Bruce Peel, *Early Printing in the Red River Settlement*, 1859–1870 (Winnipeg: Peguis Publishers, 1974), pp. 1–3, 25.

The distribution of printing activity in Canada soon after Confederation continued to display distinct regional variations.[24] In 1871, 372 establishments employed 4,298 workers in printing, bookbinding, engraving and lithography. Of all national output, 57 per cent was produced in Ontario and 30 per cent in Quebec. Considering that Ontario had only 46 per cent of the Canadian population, that province had a disproportionate share of total graphic arts trade. This imbalance was even more pronounced in 1881 when Ontario accounted for 60 per cent of output and Quebec had fallen to 28 per cent.

In Quebec and the Maritime provinces printing was highly centralized in the major cities. Montreal's share of the Quebec market rose from 63 per cent to 79 per cent between 1871 and 1881, and with Quebec City it produced 90 per cent of all work in the province. In the same decade Saint John accounted for 72 per cent of New Brunswick's production and Halifax's share of Nova Scotia printing was consistently over 80 per cent. In Ontario on the other hand, Toronto's share of provincial production fell from 48 per cent to 45 per cent. By 1881 London, Hamilton, and Ottawa accounted for 7, 8, and 9 per cent respectively. Almost one third of the output of Ontario print shops, therefore, took place outside the province's largest cities. Nevertheless, considering that in 1881 Toronto had just 4.5 per cent of Ontario's population, and Montreal a little over 10 per cent of Quebec's, the urban nature of the printing industry is apparent.

According to 1871 census returns, Montreal was the centre of Canada's small engraving and lithography trade, accounting for 88 per cent of production. No other centre had a specialized engraving and lithographic firm of any size, aside from a bank note engraving company in Ottawa. By 1881, however, Montreal's share of this trade had fallen to about 66 per cent. Toronto firms now produced about one third as much engraving and lithography as Montreal, while Hamilton was also developing a considerable trade. But statistics on industrial establishments may in fact exaggerate Montreal's dominance. The 1871 census of "occupations of the people" listed 106 engravers and lithographers in Montreal (compared to 41 in Toronto), giving it only 45 per cent of the national total. By 1881 Montreal listed 130 in these trades while Toronto counted 107, a decline in national share for Montreal to 36.5 per cent. One possible explanation for this discrepancy is that engraving and lithography in Montreal may have occurred in firms specializing in these activities, while in the Ontario centres it was carried out by printing offices as a sideline to their general letterpress and stationery business.[25]

Given these statistical uncertainties, it is difficult to estimate the relative size of the engraving and lithography industry compared to that of other printing. One clear trend is that engraving and lithography firms during the 1870s increased their production at a faster rate than general printers. National output for printing offices in 1871 stood at $3,420,302 compared to less than $200,000 for lithography and engraving, including bank note production. By 1881 printing offices were producing $4,742,904 while engravers and lithographers had tripled their output to about $600,000. The most dramatic growth seems to have taken place in Toronto. While Montreal had just one more engraving and lithography firm in 1880 than it had a decade earlier, Toronto's industry had grown from two to ten. And while Montreal's output had increased from $118,600 to $326,000, not counting bank note engraving, Toronto companies increased the value of their products from just $4,700 to almost $100,000.

As an industry, graphic arts was not a major factor in the Canadian manufacturing sector. As a percentage of production in all Canadian industrial establishments, printers, bookbinders and engravers and lithographers accounted for just under 2 per cent in 1871 and just over 2 per cent in 1881. Similarly, their share of national employment during the decade hovered between 2 and 3 per cent. These figures do not even

24. Unless otherwise stated the following information was compiled from Canada, *Census* (1870–71), v.1 Table 1; v.2, Table 13; v.3, Tables 38, 40, 46, 53, 55; Canada *Census* (1880–81), v.1, Table 1; v.2, Table 14; v.3, Tables 39, 41, 42, 47, 54, 56.

25. This may have been the case, for example, with the Toronto firm W. C. Chewett & Co. During the 1860s this company carried on a large and varied trade as bookseller and stationer, bookbinder, job printer, book printer, lithographer and engraver. Similarly, the London *Free Press* in 1881 added a lithographic department employing ten hands to its existing newspaper and job business. See Donald W. Mcleod, "William Cameron Chewett and W. C. Chewett & Company of Toronto, Printers and Publishers," *Papers of the Bibliographical Society of Canada* 21 (1982): 13–17; *Printer's Miscellany* (Aug./Sept. 1881), p. 24.

include major producers and employers like the railways and agriculture.

Newspapers

Early Canadian printers produced a wide variety of work. But they were perhaps most famous, or notorious, for their newspapers. In her classic account of pioneer life, Susanna Moodie remarked that "the Canadian cannot get on without his newspaper any more than an American could without his tobacco."[26] A more recent observer has aptly pointed out that colonial readers turned for information about their world not to books but to newspapers.[27] Usually consisting of a single sheet folded in half or quarters, the newspaper of this period was plainly laid out in rigid columns that, as the contents increased over time, were set with smaller and smaller types. Large display types for headlines and advertisements were not appropriated from commercial job work until the time of Confederation. Similarly, until the rise of a commercial wood engraving trade in major cities, illustrations were restricted to a few small ornaments and "cuts" sold by the type foundries. The contents consisted of small advertisements consuming one third to two thirds of the space, government announcements, local affairs, news clipped from other papers foreign and provincial, humour, trivia and verse, a light serialized novel, and, in the French press, learned discourses on philosophy and culture. Beginning in earnest in the 1820s, newspapers also featured increasingly abusive political commentary.[28]

Until truly independent newspapers began to be established midway through the first decade of the 19th century, the early news sheets steered clear of politics. The offical *Gazette* did attempt some coverage of current events. But as the publisher was appointed by the Governor, it remained "a pallid, neutral, harmless sheet without any really vital role to play in the social and political life of the community."[29] The number of non-official newspapers, and their relevance to the community, began to increase in the early 1800s with the establishment of papers like the *Quebec Mercury* and *Le Canadien* (both c. 1806–7), which took opposite sides of the ethnic, religious, and constitutional question in Lower Canada, and Anthony Henry Holland's *Acadian Recorder* (Halifax, 1813). This growth accelerated after 1812.

The emergence of independent newspapers derived from ecomomic change and political struggle. Growth in the economy and the reading public produced revenue from the sale of commercial job work, advertisements and subscriptions. The construction of roads and the commencement of stagecoach and steamship services made both information gathering and distribution of papers easier and cheaper. Communication was further accelerated with the opening of telegraph lines in the 1840s and railways in the 1850s.

Political conflict initially centred on colonial governments dominated by cliques of privileged, urban, Church of England or Roman Catholic office holders and acolytes. This power monopoly, combined with grievances over land speculation, taxation, poor roads and schools, led to much unrest among emerging local élites of merchants, professionals, and gentleman farmers who sat in the assemblies. As in the United States and Britain these new middle class radicals used the press as a club with which to beat the establishment. In the colonies a group of enterprising printer-editors came forward to produce a profusion of newspapers that represented not only the reform faction but also the Tory response and a strictly "commercial" orientation.[30]

The practice of political journalism before the 1840s was risky, though one historian argues that the popular reform papers were at least financially more successful than their commercial and Tory counterparts. Reform editors were arrested, fined or jailed and their shops and persons were on occasion attacked by Tory mobs. Étienne Parent spent four months in jail in 1838 and William Lyon Mackenzie's types were once hurled into Lake Ontario. But they were more fortunate than the Tory Henry Winton of St. John's, who was set upon one night by a

26. Susanna Moodie, *Roughing it in the Bush* [1852], quoted in Paul Rutherford, *The Making of the Canadian Media* (Toronto: McGraw-Hill Ryerson, 1978), p. 5.
27. Parker, p. 27.
28. Rutherford, *Making*, pp. 13–19.
29. Kesterton, p. 9. For a portrait of Louis Roy's *Upper Canada Gazette*, see Colgate, pp. 126–27.
30. Some, like William Lyon Mackenzie and Étienne Parent, were not trained printers. Reflecting an emerging division of labour in newspapers, Mackenzie was an entrepreneur and journalist who supplied the capital and management for a business and hired journeymen to do the printing; see Rutherford, Making, p. 11.

gang who cut off his ears with a clasp knife. Through the 1830s and 1840s the local reformers managed to wrest press freedom and "responsible government" from colonial governors.[31] From this point newspapers fell under the tutelage, often assured by direct cash subsidies, of the new parties that vied for control of the assemblies and after 1867 the legislatures of the new Dominion. Party journalism was to reach its high point in the 1880s, after which the influence of mass circulation evening papers began to set the tone for all dailies. Regardless of party, however, the papers of the mid-19th century articulated a bourgeois world-view promoting economic growth, self-improvement, self-reliance, social harmony and a respectability.[32]

Between 1813 and 1836, the number of newspapers in Lower Canada increased from five to twenty and in Upper Canada from one to thirty. In roughly the same period, forty newspapers were established in the Maritime provinces, twice as many as had been founded in the previous sixty years. These were established not just in the provincial capitals, but also in a growing number of regional towns. Due to small populations and to high subscription fees and postal charges, the circulation of these papers was small by modern standards: on average less than four hundred. But their readership and impact was far greater due to the practice of passing papers from hand to hand and reading them aloud in homes, taverns, and reading rooms.[33]

Through the 1840s and 1850s the number of newspapers continued to expand, especially in Canada West/Ontario, whose economy and population, fed by immigration, agricultural prosperity and railway building were booming. By 1857 there were 291 newspapers in British North America, 159 in Canada West and 54 in Canada East. One notable feature of the mid-19th century period was the rise of country papers, and the founding of papers appealing to commercial, agricultural, ethnic and religious interests. So many papers were there that in 1871 a copy of one journal or another existed for every family in Canada.

The other major trend, which had implications for printing technology was the establishment of daily newspapers. The first attempts in 1830s in Montreal and Toronto failed. But in the following decade dailies were firmly established in both those cities, the first dailies being the Montreal *Gazette* and Montreal *Herald*. A market for daily papers was encouraged by increases in commercial activity in the period and by the improvement in communciations brought about by the telegraph and better transportation. These increased the demand for and the availability of up-to-date business and political news. Advances in printing technology, meanwhile, allowed for rapid and cheap production. Through the 1850s and 1860s many more dailies were established in most cities and major towns. By 1873 Canada had 48 daily papers, over half of which were in Ontario. By 1881 the number had increased to 62, of which 29 were in Ontario. For the most part these papers still had small circulations that appealed to a mainly middle-class readership divided by political, language, ethnic or religious allegiances. One estimate placed the average for all editions of a single paper to be just 5,700. Only the Toronto *Globe* (45,000) and the Montreal *Witness* (23,000) had large circulations. Just beginning in this period was the development of mass circulation popular one cent dailies like the Montreal *Star* and Toronto *Telegram* that were to have such an impact from the 1880s onwards. Papers were beginning, however, to extend their circulations outside cities. In 1876 the Toronto *Globe* and its rival the *Mail* both engaged special trains to rush their papers to towns west of Toronto as far as London.[34]

Commercial Printing

The output of the first presses in each colony reflected the needs of a pioneer society for the establishment of a framework of law and government and for the creation of an ordered system of land distribution and tenure. The products thus followed a standard pattern: laws and

31. Press freedom is said to have been won by Joseph Howe in 1835, when a jury acquitted him of seditious libel, though the experience of Parent three years later would belie this.
32. James Stewart Martell, "The Press of the Maritime Provinces in the 1830's," *Canadian Historical Review*, 19,1 (March 1938) p. 35; Rutherford, *Making*, pp. 24–28, 49. For an example of one newspaper publisher's struggle, see Douglas Fetherling, "E. J. Barker and the *British Whig* of Kingston," *Devil's Artisan*, 29 (1991), pp. 3–32.
33. Kesterton, pp. 24–25, 11; Martell, pp. 27, 47; Parker, pp. 57–58.
34. Kesterton, p. 11; Rutherford, *Making*, p. 11, 22–23, 29; Rutherford, Victorian, pp. 35,46, 51–54; *Printer's Miscellany* (Sept. 1876), p. 18. *Printer's Miscellany* is hereafter cited as *PM*.

proclamations, journals of the Assembly, a semi-official newspaper or *Gazette* carrying government announcements, blank forms, public notices. One of the earliest surviving imprints of the Halifax press is a blank death certificate printed for use by the County Coroner. The lot of these printers was not always easy. While they were expected to avoid any involvement in political controversy and toe the official line on all matters, they found their modest salaries or government contracts both too necessary and inadequate. They tried to supplement this income with a variety of job work.

Even after 1840, when opportunities for non-government work improved, a commission as Queen's Printer or the granting of a parliamentary or departmental printing contract remained a coveted commodity. In the new Province of Canada the joint holders of the Queen's Printer commission held lucrative lifetime monopolies to print laws and statutes and the Canada Gazette. Before and after Confederation work to print parliamentary and departmental publications was let by contract. This system ranged from local patronage of small job and newspaper offices to competitive bidding by some of the largest printers in the country. The struggle for this work was marked by political backscratching and occasional fraud. Controversy over the awarding of federal printing contracts ended only with the opening of a government Printing Bureau in Ottawa in 1889.[35]

The variety of non-governmental pamphlet and job work reflected the preoccupations of British North American and Canadian society: political and religious controversy, the construction of the institutions of a settled society, the conduct of commerce and recruitment of capital. Pamphlets on a variety of subjects were printed, ranging from tracts, sermons and pastoral addresses to political polemics and religious controversies, the statements of disputants in legal cases, and short discourses on dental care, cholera, and the treatment of venereal disease. Also produced were booklets for clubs, fraternal benevolent societies, and religious groups containing constitutions, bylaws, annual reports, or meeting minutes.

The printed ephemera of a growing commercial culture also issued from the scattered printshops. Prospectuses and annual reports have been frequently preserved. Auction and land sale notices, price lists, theatre bills, advertising handbills, tickets, labels, bills, and blank commercial forms were also produced, though only a fraction have survived. More frequently preserved have been election notices and candidates' circulars. As the century progressed this work became characterized for its bold and eclectic typography, often executed in giant wood types. More substantial than this were the directories and catalogues, which as trade developed became more and more important. The first well-illustrated Massey catalogue, for example, was issued in 1862.[36]

Printers also provided several other publications important to a newly, or barely, literate public. Primers, ABCs, or spellers were common products of early presses because they were assured a large sale. Montreal and Quebec City printers in the 18th century found a ready market for French and Latin grammars and primers, as Canada after the conquest was cut off from its traditional supply in France. And in response to fears of contamination by republican ideas through cheap American texts, printers in the early 19th century turned out numerous editions of William Fordyce Mavor's *English Spelling Book* and Lindley Murray's *English Reader*. In the realm of religious education and devotion, 18th century printers in Montreal and Quebec City did a steady business in French, Roman Catholic catechisms and other religious works. At least seven editions of the catechism were published before 1800. Protestant devotional works, mostly hymnals and Church of England catechisms, began to be printed as English settlement increased. A Toronto firm established in 1829 by Egerton Ryerson for the Wesleyan Methodist Conference evolved into one of the largest print-

35. Tremaine, *Bibliography*, pp. xii–xiv; Samuel Thompson, *Reminiscences of a Canadian Pioneer* [1884] (Toronto: McClelland & Stewart, 1968), pp. 216–29; *PM* (Oct. 1876), p. 30; *PM* (Jan. 1880), pp. 114–15; Hana Aach, *Impressions: Stories of the Nation's Printer* (Ottawa: Supply & Services, 1990), pp. 33–41, 83–95, 106, 119.

36. Tremaine, *Bibliography*, p. xiv; Patricia Lockhart Fleming, *Upper Canadian Imprints, 1801–1841: A Bibliography* (Toronto: University of Toronto Press, 1988); T.G. Dilworth, "Thomas Nisbet: A Reappraisal of His Life and Work," *Material History Bulletin*, 15 (Summer 1982), pp. 77–78; Toronto Public Library, *A Century of Ontario Broadsides, 1793–1893* (Exhibit Catalogue, Toronto Public Library, 1965). The Massey catalogue reference is from Bumsted, p. 301.

er/publisher/booksellers of the Victorian era, the Methodist Book and Publishing House.[37]

With the establishment of public school systems in mid-century, a market for locally produced textbooks developed, though controversy flared over the importation of texts by departments of education. Textbooks became the backbone of the Canadian English book publishing trade. In the 1840s and 1850s printers in various provinces acquired the rights to reprint the successful Irish National school book series and other British texts. In the following decade, the Montreal printer/publisher John Lovell began a Canadian textbook series. The French market in Quebec, however, was dominated by the religious orders through their schools and colleges. Largely on the basis of textbooks, the printing, publishing and stationery firm of J. & A. McMillan of Saint John became the most important publisher in the Maritimes. In the 1870s and 1880s through use of aggressive marketing and political influence, Toronto printing/publishing firms acquired near monopolies on school book publishing in Ontario, Manitoba and the Northwest and a large share of the Quebec and Maritime market. These firms, the Globe Printing Co. and James Campbell & Son (partly owned by Thomas Nelson & Sons of Edinburgh), W. J. Gage & Co., Copp, Clark, and the Methodist Book and Publishing House established Toronto as the new book publishing centre of English Canada.[38]

The almanac made an early appearance in British North America, the first one being printed by Brown & Gilmore in Quebec in 1764, and was a lasting staple of the printer's trade throughout the 18th and 19th centuries. Published annually in sheet or booklet form, the almanac was a fixture in many homes where it served as a handy reference. A typical almanac consisted of a calendar containing astronomical data for a given locality, dates of holidays and religious feasts, lists of civil and ecclesiastical officials, dates of court sessions, and tables of currency and measure conversions. It was also an eclectic compendium of homespun wisdom and practical advice, apocryphal tales, astrology, doggerel verse, and more literary fare often cribbed without attribution from other sources. Editions in the 18th century averaged about 200, but by 1831, William Lyon Mackenzie was advertising sales of his almanac to merchants by the "Dozen, Hundred or Groce." The Canadian Almanac, first published in Toronto by Hugh Scobie in 1848, enjoyed a long life, and in the 1870s was a mainstay on the list of the successor firm, Copp, Clark.[39]

Early Canadian printers found the high capital costs and uncertain sales too much a risk for themselves to publish books of literature or belles lettres. More common was the sensational broadside that recounted a notorious event like the execution of Louis XVI of France or contained the confession of a condemned criminal. On a slightly more refined level were the "carriers' addresses," broadsides in verse printed at Christmas as gifts for regular newspaper subscribers. A few books of verse and fiction were published, usually financed either by advance subscription or at the author's expense. This spared the printer the burden of risking his own capital on a book job.

Most literary activity was published in the form of essays, stories and poetry in newspapers and in a few short-lived magazines. John Howe's *Nova Scotia Magazine* and the Neilsons' *Quebec Magazine* enjoyed a brief life in the late 18th century. But widespread, though still sporadic, activity did not begin until the 1820s and 1830s. Based in Halifax and Montreal, a score of ephemeral English and French reviews published a selection of local material and excerpts from European books and magazines. Several important Canadian writers, including Thomas McCulloch, Thomas Chandler Haliburton and Michel Bibaud, saw their work first published in periodicals produced by British North American printers.[40]

The establishment of the *Literary Garland* in Montreal by John Lovell and John Gibson in 1838 marked a new period in English magazine publishing, as this journal was to continue for fourteen years. The *Garland* published original

37. Fleming, Upper, pp. 536, 540, 546; Tremaine, *Bibliography*, pp. xv–xvi; Parker, pp. 208–9.
38. *PM* (Oct. 1879), pp. 52–53; *PM* (Nov. 1879), p. 68; *PM* (Feb. 1880), p. 113; Parker, pp. 116–130, 202–4.
39. Patricia Lockhart Fleming, "Almanacs as an Index of Popular Culture," Paper presented at Discourse/Language in Canada Conference, University of Toronto, 19–22 April 1990, pp. 1–8; Fleming, *Upper*, p. 148; Parker, pp. 77, 207.
40. Tremaine, *Bibliography*, pp. 653–58; Parker, pp. 59–60, 69–71, 82; Kesterton, pp. 25–26; Fraser Sutherland, *The Monthly Epic: A History of Canadian Magazines, 1789–1989* (Markham: Fitzhenry & Whiteside, 1989), pp. 18–20.

fiction, verse, reviews and criticism as well as steel engravings and new music. The first magazine in Canada to pay its contributors, it published works by Susanna Moodie, Catherine Parr Traill, and John Richardson. Two later, weekly illustrated papers were also important vehicles of original writing and images. These were the *Canadian Illustrated News* (1869–83) and *L'Opinion Publique* (1870–83), both published by George-Édouard Desbarats in Montreal. In general, magazines during the 1860s and 1870s seem to have had longer life spans than their predecessors but they faced withering competition from slick, profusely illustrated American publications like Harper's Monthly. A successful departure from the literary focus of magazines was the *Canadian Journal* (1852–78), first printed by Hugh Scobie of Toronto. Its specialty was railways, canals, and other aspects of engineering and science.

Literary and trade book publishing fared even less well than magazines. In neither French nor English could publishers compete with imports in the sale of cheap, popular fiction. Successful Canadian authors like Haliburton, Moodie, Traill and Richardson had their books published outside Canada. In most cases authors and printers still allayed the financial risk of publishing by seeking advance subscriptions or by issuing books in installments. John Lovell was the dominant English book publisher up to the 1860s, though his firm's staples were directories and textbooks. French language publishing at mid-century was marked by monumental multi-volume historical works that eventually sold thousands of copies in several editions, most notably: François-Xavier Garneau's *Histoire du Canada depuis sa découverte jusqu'à nos jours* (1845–48); an abridged version of the *Histoire* for schools (which sold 30,000 copies in 25 years); and an edition of the *Relations des Jésuites* (1858).[41]

Printing as a Business

The limited output of early Canadian print shops reflected economic and technological restrictions imposed on proprietors. Printing in British North America before 1840 was a small-scale enterprise, though towards the end of the 1830s larger scale operations were being established. The pioneer or country printer got by with a single press, just over a thousand pounds of type, and the standard equipment and implements: type case frames and type cases, blankets, ballstocks, chases and galleys, composing sticks and imposing stones, letter boards, and the wooden "furniture" used in locking up the type forms. With the help of a journeyman, an apprentice or two, and perhaps his wife and children, such a master printer turned out the miscellaneous products of the early press. Charles Fothergill's *Palladium* office in Toronto was a very small shop. In 1838 when Samuel Thompson took over as manager, he found a jumbled mass of type, an old Columbian press, and a "rough lot of lads" that had to be trained to their tasks. Larger outfits were characterized more by the amount than the nature of their equipment. In 1833, William Lyon Mackenzie, one of the more active printers in Toronto, owned two iron presses, an old wooden press, probably used to pull proofs, and a small foolscap press. Mackenzie was not a printer himself. He represented an emerging breed of printshop proprietor, the editor and entrepreneur who employed others to run the mechanical side of the business. Seven or eight journeymen and four apprentices worked in his shop during the 1830s, depending on requirements. Like many printers, he also carried on a book and stationery trade.[42]

In early days, when it was handmade and imported, type was a costlier capital item than presses. One historian estimates it could equal or surpass the cost of all other equipment. Another estimates that up to two thirds of a printer's investment in plant was for type, while only five to fifteen per cent was for presses. Because of this high capital cost, the printer endeavoured to have his types either on the press being printed or in the process of being set for a new project. Idle type, left "standing" in the form or unused in the case, was a dead weight on his shoulders. Presses, on the other hand, were sometimes kept standing by for occasional busy periods.[43]

41. Parker pp. 74–91; Kesterton, pp. 26, 62; Sutherland, pp. 20–23.

42. Patricia Lockhart Fleming, "William Lyon Mackenzie as Printer, 1824–1837," *Devil's Artisan*, Part I, 5 (1981), pp. 6–7 & Part II, 6 (1981), pp. 6–7, 10; Thompson, p. 103; Wroth, pp. 62–67; Rollo G. Silver, *The American Printer, 1787–1825* (Charlottesville: University Press of Virginia, 1967), p. 30.

43. Philip Gaskell, *A New Introduction to Bibliography* (New York: Oxford University Press, 1972), p. 163; Wroth, pp. 65, 93.

After overhead, the two greatest ongoing expenses to the printer were for paper and wages, each of roughly equal proportion with variation according to the supply of each. These costs placed certain restrictions on the printer. While the fixed capital cost of setting up a printing shop was said to be "not in itself enormous," printing required that large additional sums be spent in advance on paper before any revenue could be realized. This was especially the case in British North America, where, at least in the 18th century, all paper for the entire year had to be imported during the shipping season from Britain.[44]

While labour could, to some extent, be taken on and laid off as needed, this flexibility was limited by a general shortage of skilled journeymen in the colonies. To keep a shop operating continuously, printers worked on several print jobs concurrently, switching back and forth when work on one job was stalled by holdups at another stage of production. Minor job work was important for filling in gaps in the production of larger projects. As well, journeymen were likely to take a hand at both the press and the case, as the moment demanded.[45]

Labour costs had another influence, especially in book production, that would have been felt in a small market like British North America. The average size of an edition during the hand press period in Europe was 1500 copies. This was influenced not simply by demand but by the unit labour-costs of production. High one time costs for composition encouraged a larger run of books. But beyond 1500 copies the cost of hand presswork became the most important expense, and this did not diminish as more copies were printed. Moreover, a larger edition would take longer to sell, thus tying up capital until all copies were sold. Similarly, the printer would not print a small number of copies and leave type standing in the form to print more copies on demand, because this tied up type. For British North America printers, therefore, the unit cost of producing a book for the few hundred possible buyers was usually too high to contemplate. Any small edition they might produce would have a higher unit cost than most competing, imported matter. Only those books guaranteed a large and rapid sale—almanacs, primers, catechisms—were worth the trouble. Hence the printer devoted his energies to government work, newspapers, and cheap ephemera.[46]

Beginning in the 1840s, a segmentation of the printing industry began to appear. On the one hand were highly capitalized newspaper and commercial printing houses that used steam power and the newest press technology. On the other were small country newspaper and job printers and their urban counterparts, who increasingly concentrated on job work alone. While using the new platen job presses and cylinder machines, capital requirements were not overwhelming and entry to this sector was relatively easy.

The first industrial firms emerged to serve the government printing market, then diversified into book, periodical and commercial work. By 1867 John Lovell's plant employed 150 people who ran twelve large steam presses, six job and hand presses, and a variety of bindery equipment. At around the same time, the five-storey Desbarats factory in Ottawa ran three Hoe and three Adams presses, a job press, a bindery, and a stereotype operation and employed almost a hundred. In Toronto in 1875 George Maclean Rose opened a new four storey plant with a similar range of operations employing about 150. The other emerging industrial giants were the daily newspapers. In addition to daily and weekly editions of their journals, these companies usually printed job work in order to maximize revenues from the capital invested in equipment. Even newspapers in smaller cities were substantial operations. Non-editorial staff of the Saint John *Daily Telegraph* in 1876 consisted of 22 in the newspaper division and five in the job office. Five years later, the London *Free Press* opened a new three storey building to house its newspaper, lithographic, book and job operations. The job room alone employed 21 hands and ran seven presses. In the news department, fifteen to twenty compositors worked at the case.[47]

In 1871 six printing firms ranked in the top 150 (one per cent) Canadian industrial establishments, as measured by number of workers, fixed capital investment, gross value of production,

44. Wroth, p. 151; Gaskell, p. 177; Parker p. 49.
45. Gaskell, p. 164–66.
46. Gaskell, pp. 161–62.
47. Parker, p. 157; Aach, p. 51; Ottawa *Times* (21 January 1869); Elizabeth Hulse, "The Hunter Rose Company: A Brief History," *Devil's Artisan*, 18 (1986), p. 5; *PM* (Oct. 1876), p. 37; *PM* (Aug./Sept. 1881), p. 24.

and total valued added. These firms were: Hunter, Rose & Co., Robertson & Cook, James Beaty, and The Globe, all of Toronto; Isaac B. Taylor of Ottawa; and John Lovell of Montreal.[48] Of these, Hunter, Rose and John Lovell were primarily commercial printers, while the remainder published daily newspapers in addition to printing job work. Their fixed capital ranged from a low of $40,000 to a high of $165,000. Such large printers were an urban phenomenon. In 1871, on average, Toronto shops employed 46 workers, while Ottawa shops had 52 hands and Montreal shops 29. On the other hand, Ontario printers outside Toronto, Hamilton, London and Ottawa averaged only 5 employees. In Quebec outside Montreal and Quebec City the figure was identical.[49]

At the large end of the small shops were the weekly newspaper offices of large country towns. Even these demanded considerably less capital than the large industrial operations. In the late 1870s, a second-hand plant consisting of a cylinder press, a hand press and a job platen press, plus types and accessories, could be had for $3000. In 1874 the three Belanger brothers of Sherbrooke, Quebec bought all they needed to establish the weekly *Le Progrès* and *News* for $4000, payable over eight years. For this, they acquired, second-hand, a cylinder newspaper press, two jobbing platens, and a hand press. With this equipment one brother and a journeyman, assisted by another brother and at least one apprentice, did all the work of the shop.[50]

The country cousins of these town offices required even less capital and posed a standing temptation to ambitious entrepreneurs of limited means. The second-hand outfit of a country newspaper office could be purchased for as little as $1000 (in the case of the Iroquois [Ont.] Times). One correspondent to the *Printer's Miscellany* estimated the capital required to start in business at $1200 to $1500. This does not seem like a huge amount for journeymen who, if they avoided unemployment, earned annual wages of $400 to $500. But journeymen in the late 1870s could read warnings of the perils of country printshop proprietorship. Their annual revenue from newspaper ads and subscriptions and from job work might barely cover their wage costs.[51] And in finding job work, their biggest peril was the larger printer in town.

> *It is not enough, now-a days, to get a hand press and a few hundred pounds of type, with other material necessary in a job office ... to make a decent living out of a country newpspaper – not even with the assistance of a ready-printed outside. The proprietors with cylinder machines and the newest job presses will not only give a much larger paper for less money, but to keep themselves afloat in these hard times, with canvassing the country for a hundred miles round, for the printing of bill heads, letter headings, and all other work not wanted on the spur of the moment. This leaves for the job office only the printing of small bills, in small numbers, for large bills for important auction sales, exhibitions, etc, will also be sent off to offices which can get them up in good style.*[52]

As noted by the correspondent, country printers filled some of their pages with low-cost material by purchasing pre-printed sheets, or "patent outsides" from city suppliers. These sheets, supplied by such firms as the Hamilton *Herald* office, J. C. Cameron & Co. of London, and S. Frank Wilson's Auxiliary Publishing Co. of Toronto, featured patent medicine advertisements and articles of general interest to country readers. In 1877 these three firms published 58 patent outsides. For the country printer, outsides cost less than the price of newsprint, composition and press time for work done on the premises.[53]

The other way the country printer survived was by reducing labour costs to a minimum. Some relied on family labour, though few advertised as did one "young, single and enterprising newspaper proprietor," asking to correspond "with a young female compositor with a view to matrimony." [54] More commonly, country printers

48. Elizabeth Bloomfield and G. T. Bloomfield, *Patterns of Canadian Industry in 1871: An Overview Based on the First Census of Canada* (Research Report, University of Guelph, Sept. 1990), pp. 49, 73–74.
49. Canada, *Census* (1870–71), v.2, Table 38.
50. *PM* (June 1878), pp. 337–8; Jean-Pierre Kesteman, *"Le Progrès" (1874–1878): Étude d'un journal de Sherbrooke* (Département d'histoire, Université de Sherbrooke, 1979), pp. 19, 27, 49–51.
51. *PM* (Jan. 1878), p. –; *PM* (June 1878), p. 338. For wage rates of printers in Toronto, Montreal, and Saint John, see *PM* (July 1876), p. 5; *PM* (Sept. 1876), p. 23; *PM* (Oct. 1876), p. 39.
52. *PM* (Nov. 1877), pp. 111–12.
53. *PM* (Nov. 1876), p. 60; *PM* (April 1877), p. 167; *PM* (May 1877), p. 190; Elizabeth Hulse, "Newspapers Printed on the Co-operative Plan," *Papers of the Bibliographical Society of Canada*, 22 (1983), p. 83.
54. *PM* (Jan. 1878), p. 179.

took on up to three or four apprentices for every journeyman. "If it was not for this class of cheap labor newspapers in country districts would not have an existence," wrote the *Printer's Miscellany* in 1877.[55]

The urban counterparts to these small rural offices were what later came to be called "bedroom shops," job offices run by self-employed journeymen. Capital requirements for such shops were low. With a hand press or jobbing platen, an assortment of types, and the cheap labour of family or apprentices, they earned their owners a precarious existence printing cards and handbills. For some journeymen, this may have been an alternative to unemployment or migration. Certainly during the depression of the mid- and late-1870s such shops were seen as a drag on prices for larger, more established offices. The book and job sectors of city printing industries in later years continued to be marked by competitive pressures on prices and, ultimately, wages.[56]

Part 2 – Printing Technology before 1880

Printing historians agree that the period between 1500 and 1800 was technically stable. Despite some local variation, "printers everywhere handled closely similar tools and materials in closely similar ways."[57] Metal types, which had been cast in a special mold, were arranged in words, lines and columns, locked into a form, placed on a wooden press, and inked. Paper was damped and placed in a frame, or tympan, which was then laid face down over the inked type form. The whole was then subjected from above to a short, sharp impact from a platen activated by a lever pulled by the printer. This brief contact between type and paper caused the ink to be transferred to the paper. The paper was then removed from the frame, hung to dry, and folded and bound in a variety of ways.

Illustrations could be printed by two methods. The simplest, by placing relief woodcuts directly in the type form, used a technique that actually predated movable type. The intaglio, or gravure, method, developed independently but in the same period as movable type, involved engraving or etching the image on a copper plate, inking the plate, and wiping the plate to leave ink only in the incised grooves. Paper was then placed directly over the plate and the two were passed between two rollers, much like those of a wringer washer, which applied such great pressure that the paper was forced into the grooves on the plate where it picked up the ink.

Between the late 18th century and 1840 a number of technical changes were made to meet the increasing demand for both cheap and quality printed matter.[58] The traditional wooden press underwent a number of improvements, then was largely replaced by the iron hand press. Mass production became possible with the development of a cylinder printing machine to which steam power could be applied. Attempts were made to mechanize type founding, and the design of type was transformed by the adoption of display founts to serve the demand for advertising matter. Inking, meanwhile, was improved by the development of composition rollers and automatic inking apparatus. Stereotyping was developed to make permanent plates from type forms, allowing simultaneous production on several presses or by different printers and economical storage of works for future reprinting without the need to leave type idle or reset forms. Pictorial printing saw the introduction of ruling machines and the more durable steel plate, allowing more mechanical production of plates and longer print runs. The engraving of wood blocks was also expedited with ruling machines and by subdivision of tasks and of the block itself. At the same time lithography, an easier and cheaper method of reproduction, was introduced.

Printers did not adopt new technologies overnight. New presses and type founts cost money and were generally only acquired if a new shop was being established or as old plant wore out. And while types had a short lifespan, old presses were known to last decades. Moreover, some of the new techniques were suited more to mass production than to traditional book, news-

55. *PM* (Jan. 1877), p. 89; *PM* (Dec. 1976), p. 69.
56. *PM* (July 1879), p. 7; Sally Zerker, *The Rise and Fall of the Toronto Typographical Union, 1832–1972: A Case Study of Foreign Domination* (Toronto: University of Toronto Press, 1982), pp. 68–69.
57. Gaskell, p. 161.
58. James Moran, *Printing Presses: History and Development from the Fifteenth Century to Modern Times* (Berkeley & Los Angeles: University of California Press, 1973), p. 222; Michael Twyman, *Lithography, 1800–1850: The techniques of drawing on stone in England and France and their application in works of topography* (London: Oxford University Press, 1970), p. 3.

paper, and job work. Few but the largest, most ambitious, and most highly capitalized operators, for example, were interested in stereotyping or cylinder presses before the 1840s. On the other hand, most were ready to adopt new devices or techniques that were inexpensive and allowed them to do something more easily or better.

Between 1840 and 1880 the adoption of new techniques and machinery was more widespread, especially in the use of platen job presses for small commercial work and steam powered cylinder presses for newspaper production. Stereotyping and electrotyping became established in daily newspaper production in large cities. And a commercial engraving and lithographing trade also became viable. Changes in hardware involved changes in practice, altering the way that printing craftsmen did their work. Finally, the first development of a printer's supply industry in Canada, most notably for type and paper, was also seen in this period.

Hand Press

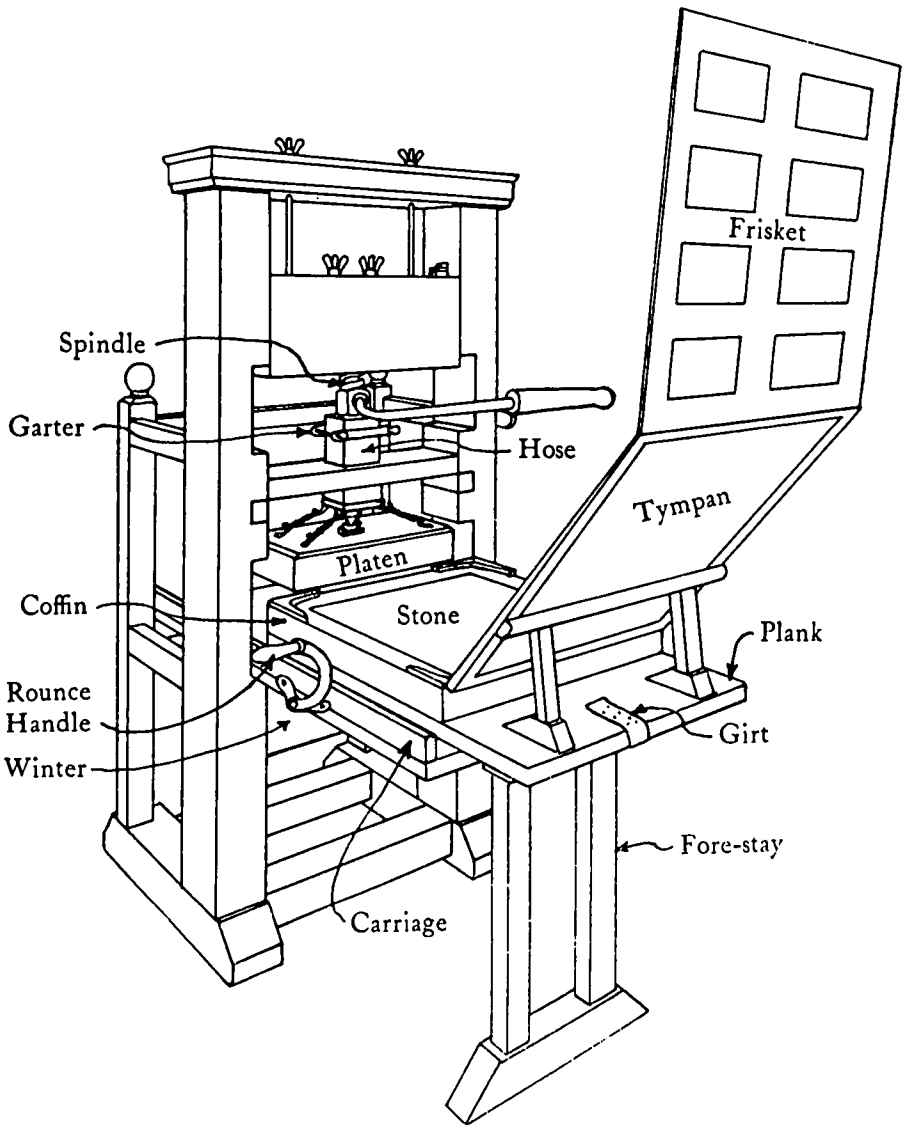
The wooden press used by early British North American printers differed very little from that first developed by Gutenberg. Its essential features were the tympan and frisket, which held the paper, a sliding carriage, which allowed the form and the tympan and frisket to be moved under the platen, and the platen itself, which was lowered to make the impression by a bar turning a wooden screw. Though simple, cheap and effective enough, the wooden press had certain disadvantages. Even when executed by the most skilled joiner, its wooden members and mortised joints made the press slightly flexible. This made for instability and hence an imprecise impression. Moreover, this same flexibility, and the use of a wooden screw, limited the power that could be achieved in one pull at the bar. A full form normally had to be printed in two pulls, one for each half. For this reason the wooden presses have sometimes been called "two pull presses."

Several avenues were pursued in the late 18th and early 19th centuries to improve the wooden press. The one improved press to be manufactured in any quantity was developed by Adam Ramage of Philadelphia between 1800 and 1810. He retained the wood frame but incorporated a number of changes developed by himself and others. By the 1820s these included a larger screw for increased impression power, an iron platen and bed, and springs to lift the platen. The Ramage press—so named, though built by various makers—was very popular with pioneer printers in the United States and British North America in the years up to 1850 because it was cheaper, lighter, and easier to transport than the iron presses then being introduced. Joseph Howe used an English-built Ramage in his early days printing the *Novascotian* in the 1820s, and William Lyon Mackenzie owned two small Ramages in 1833.[59]

Some innovators had attempted to increase impression power by substituting wedges, toggles, cams or levers for the screw. But even if properly designed these devices would not have been effective because the increased power would have damaged a wooden press. This problem could only be solved by using a new material: iron. The iron press was made possible by 1800, according to James Moran, by advances in metal casting technology and by "the rise of a class of mechanics, the forerunners of the engineers, who were to transform the nineteenth-century industrial scene."[60] By the 1820s a variety of different iron presses using a number of impression mechanisms in place of the screw were on the market. The success of certain iron presses relative to others, however, rested not simply on their mechanical attributes but on business factors—financing, manufacturing capacity, marketing. One point worth noting is that iron presses did not appreciably increase the printing rate. First embodied in the cylinder printing machine, this advance would require a complete redesign of the methods of inking, feeding paper, and making the impression.[61]

The first successful iron press was invented in England around 1800 by the Earl of Stanhope. While retaining the screw his cast-iron framed press gained greater impression power from a set of compound levers connecting the bar to the screw. While not increasing the printing rate, the Stanhope press produced sharper impressions with less exertion and could print an entire form

59. Milton Hamilton, *Adam Ramage and his Presses* (Portland, Me.: Southworth-Anthoensen Press, 1942), pp. 4–6, 10, 27–29; Silver, *American*, pp. 45–47; Moran, *Printing*, pp. 34–47; Parker, pp. 47–48.
60. Moran, *Printing*, p. 49.
61. Moran, *Printing*, p. 71.



Wooden hand press, 18th century. (Wroth, Colonial Printer*)*

with one pull. It was valued for fine printing but tended to be expensive and heavy.[62]

Of more lasting influence in Canada were a number of presses, all dispensing with the screw entirely, developed in the short span of a decade after 1812. The Columbian was invented by George Clymer of Philadelphia in 1812–1813 but was only manufactured and sold in quantity in Europe. Clymer attached the platen to a large overhead lever that was activated by a compound lever mechanism connected to the bar. By the pressman pulling the bar, the large lever was caused to descend, forcing the platen down onto the form. A counterweight, in the ornate, cast iron form of an eagle, returned the lever and platen to their resting positions. The Columbian took little effort to work and could print a form in one pull. It was extremely popular in Britain and was manufactured there at one time or another by at least 25 firms. But like the Stanhope it was heavy and expensive and outside New York newspaper offices did not find general acceptance in North America. But at least one Columbian was used in British North America, at Charles Fothergill's *Palladium* office in Toronto in 1838.[63]

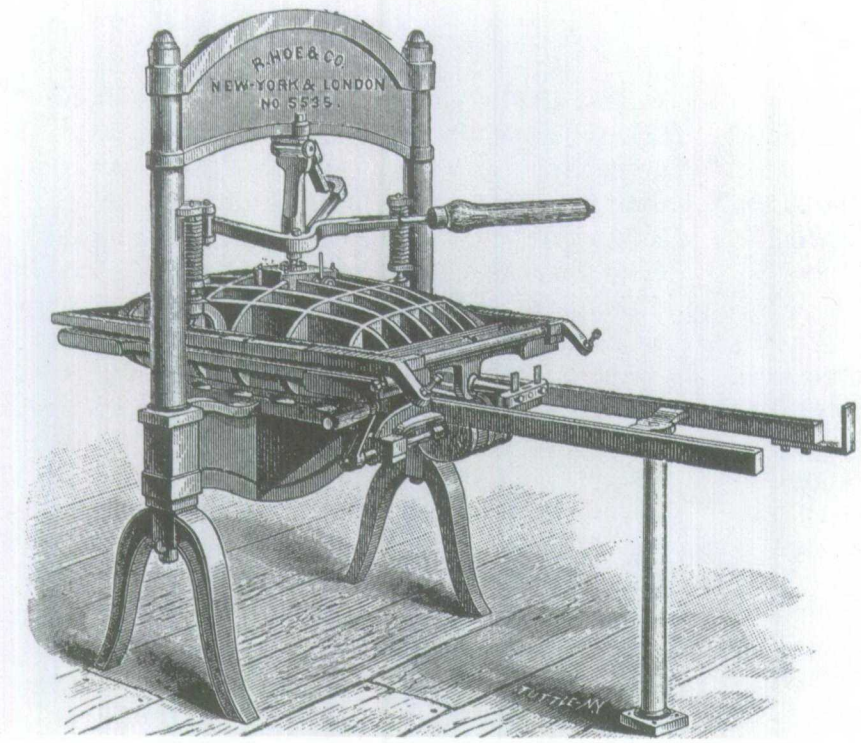
More successful were iron presses that used a toggle to lower the platen. A toggle consisted of a jointed steel rod attached above to the press frame and below to the platen. In resting postion the rod was bent at the joint, much like a leg bent at the knee. By straightening the rod into a vertical position, force was directed downwards, pushing the platen onto the form. Although its form varied from one maker to another, the toggle was incorporated in several presses that dominated the market after 1820. In 1819 John Wells of Hartford, Conn. patented one such press. A similar press was designed and built in 1821 by Peter Smith of New York City in association with Robert Hoe. In England soon after this, Richard Whittaker Cope built his own cast iron toggle press. These Albion presses had enduring popularity in the various versions built by British and European manufacturers. Most famous of all the toggle presses was the Washington, patented by Samuel Rust of New York in 1821. The Washington featured a new type of toggle whose "figure 4" configuration proved more powerful and less likely to dislocate than the type used by Wells and Smith. In 1829 Rust abandoned the heavy cast iron frame then in common use for an easily transported and assembled one incorporating simple wrought iron bars inside hollow cast iron uprights. In this improved form the Washington proved immensely popular, especially as a frontier press, and was built by various manufacturers until at least 1926.[64]

These iron hand presses were naturally well suited to Canadian conditions, especially before Confederation. In the 1830s, Joseph Howe of Halifax is known to have imported both a Wells (still existing) and a Smith press. In 1833 W. L. Mackenzie owned a Smith and an unnamed "large and powerful standing press" built by Robert Hoe. In 1832 Washington presses were being advertised in a Montreal newspaper for just $230 to $275. And in 1859 a Washington press was used to publish the first newspaper in Red River. But even after manufacturers introduced faster and more sophisticated presses, the old iron press remained in many printshops. The Montreal Type Foundry was still selling new Washington presses in 1865, while in the late 1870s second-hand Washingtons could be found advertised in the *Printer's Miscellany*. At least until the mid-1890s many rural newspapers were printed on hand presses. And well into the 20th century hand presses were used for pulling proofs, instructing novices, and printing hobby, art, and private press work.[65]

Cylinder Press

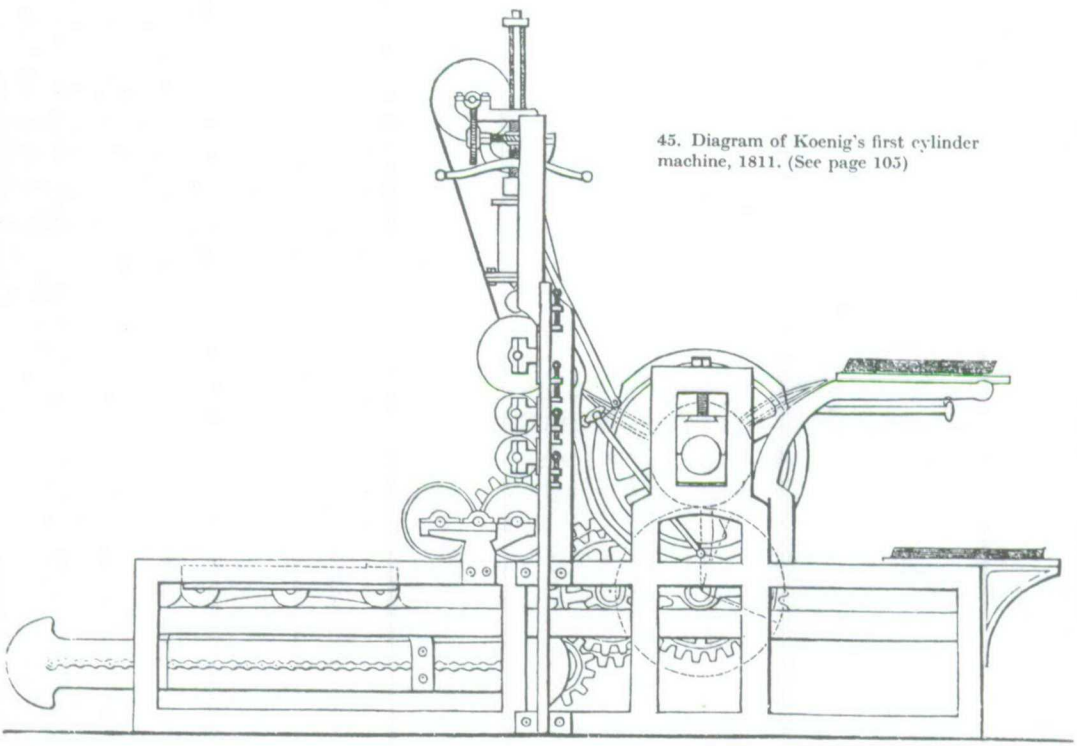
"The combination of the cylinder machine and steam-power," writes James Moran, "began the transformation of the printing trade."[66] Though the power source and the press were not necessarily related, almost the first successful application of steam power involved a complete redesign of the press. Built before the Battle of Waterloo by two Germans working in London, the cylinder press was to spawn forms that could still be

62. Moran, *Printing*, pp. 49–54; Stephen O. Saxe, *American Iron Hand Presses* (New Castle, Del.: Oak Knoll, 1992), pp. 3–6.
63. Jacob Kainen, *George Clymer and the Columbian Press* (New York: Typophiles, 1950), pp. 5, 20–22, 40–41; Moran, *Printing*, pp. 60–68; Saxe, *American*, pp. 9–13; Thompson, p. 103.
64. Moran, *Printing*, pp. 75–83, 91–99; Saxe, *American*, pp. ix–x, 23–26, 37–45, 51–53.
65. Parker, pp. 47–48; *Specimens from the Montreal Type Foundry* (1865), p. iii (hereafter cited as *MTF* (1865); *PM*, (June 1877), p. 233; *PM* (July 1877), p. 19; *PM* (July 1879), p. 6; *Canadian Printer and Publisher* (Sept 1893), p. 6.
66. Moran, *Printing*, p. 123.



Washington Press, patented by Samuel Rust 1821. (R. Hoe & Co. Catalogue, 1881)

45. Diagram of Koenig's first cylinder machine, 1811. (See page 103)



Koenig's first cylinder press, 1812. (Moran, Printing Presses*)*

found in printing offices in the 1970s. Friedrich Koenig and his associate, Andreas Bauer, were financed by three London printers who were seeking to break out of limits imposed by the hand press on their ability to cheaply produce large volumes of books and periodicals. After developing a steam-powered iron platen press, Koenig abandoned this approach and invented a machine that brought paper in contact with type by means of a revolving cylinder on which the paper was laid. The type form remained on a sliding bed, but its reciprocal movement was linked mechanically to the revolutions of the cylinder. Koenig and Bauer also provided for automatic inking by means of leather covered rollers. The first such press went into regular operation in 1812. Two years later, John Walter II of *The Times* took delivery of an improved machine that used two cylinders so the press could be fed at both ends. The new machine was installed secretly so that his pressmen could not prevent its operation. New workers began printing the daily newspaper at a rate of 1500–2000 impressions an hour. Over the next few years improvements were made to these machines: leather rollers were replaced by "composition," the means of holding paper to the cylinder were refined, and a means of "perfecting" sheets, or printing on both sides, was developed. Initially, however, the cylinder machines were limited to cheap, large-volume newspaper and periodical work because of their exorbitant price, the lack of skilled machine tenders, their slurred impressions, and their tendency to wear and smash type.[67]

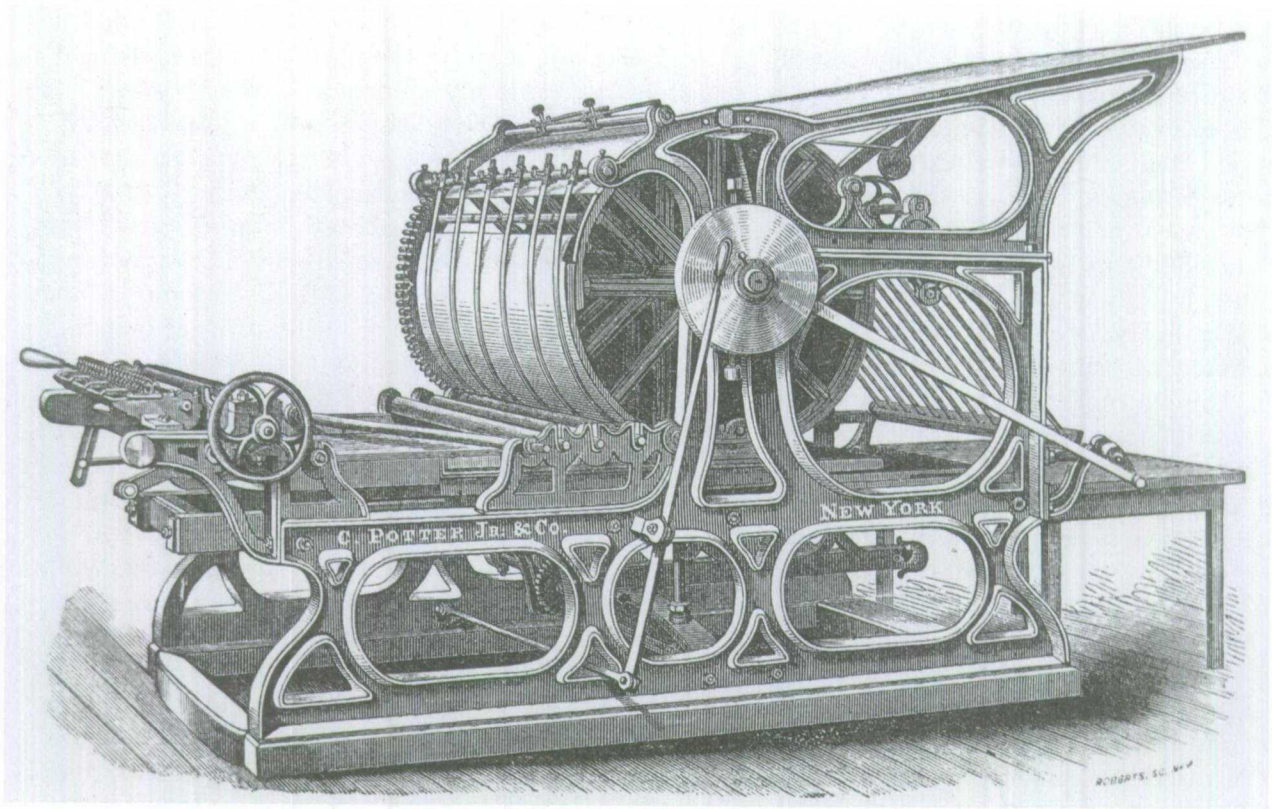
As the engineering industry developed the capability of producing the complicated mechanical apparatus, other press builders gradually entered the field with their improved versions of the cylinder machine. From the 1820s to the 1860s, work centred on enabling a smoother and faster movement of the bed, on improving inking, register, and feeding and delivery of sheets, and on eliminating manual operations. The fruits of this development for British makers was the Wharfedale press, introduced around 1859 and setting the pattern for such machines for a generation afterwards. The first cylinder press in North America was imported to the United States in 1825. Within a few years Hoe, Taylor and other American builders introduced their own versions, initially modelled on the British machines of David Napier. During the second half of the 19th century much development in cylinder machines took place in the United States, where builders met demand in two markets, for cheap, light, easily operated machines for country printers and heavy-duty city presses capable of quality work in illustration blocks and registered colour. During this period builders also perfected automatic taking off of sheets, but the labourious laying on of paper was not mechanized until the 20th century.[68]

British North American printers began to install steam power and cylinder presses in small numbers during the 1840s. The first was William Cunnabell of Halifax who in 1840 applied steam to a Washington press. Initially, the Montreal *Gazette*, daily since the early 1840s, ran its cylinder press with the power of two men at the crank. But in 1853 it installed a steam engine. That same year George Brown began to publish the Toronto *Globe* as a daily on a Taylor double-cylinder press run by steam. Printers in smaller centres, like the owner of the Fredericton *Loyalist* in 1845, also acquired cylinder machines. Large book and commercial offices joined newspapers in acquiring the new technology. In 1842 the Queen's Printer office of George-Paschal Desbarats and Stewart Derbishire managed to print 6000 copies of the *Statutes* in three weeks, less than half the time previously required. By 1847 John Lovell of Montreal had a steam press. Both this and the Queen's Printer presses may not have been cylinder machines but rather bed and platen models (see below), which were favoured for book work.

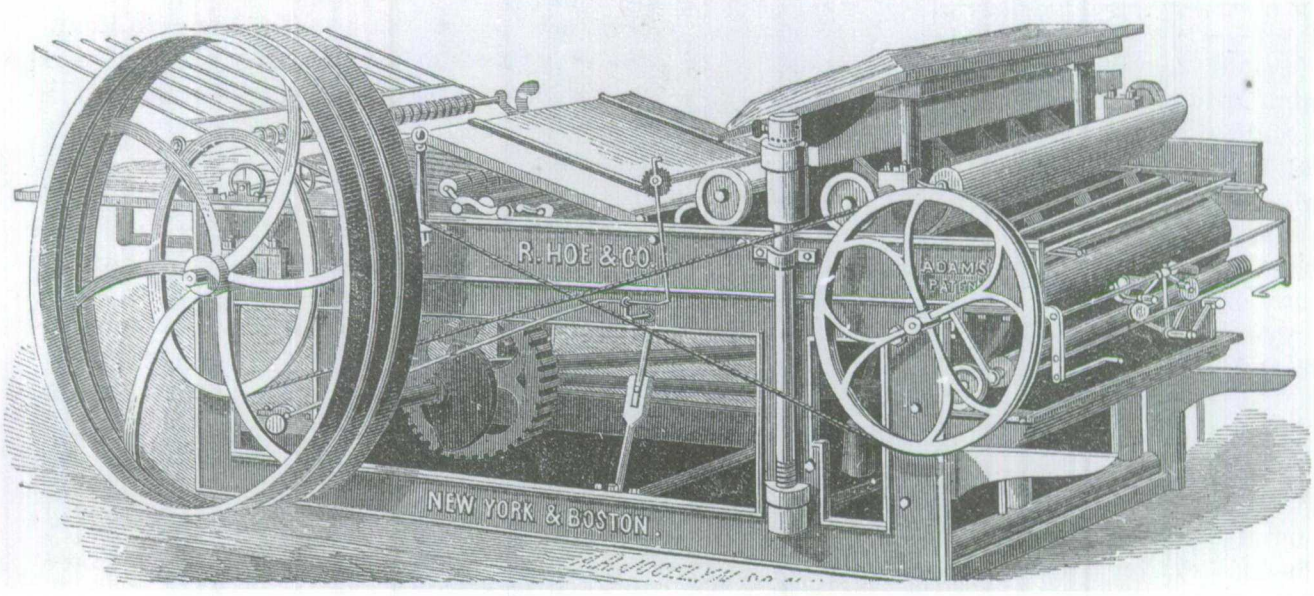
In the following decades smaller newspaper offices installed an increasing variety of cylinder presses. The 1865 Montreal Type Foundry catalogue listed four cylinder machines of different sizes, styles and prices from one builder alone. By the 1870s Wharfedales from Britain and Hoes, Campbells, and Taylors from the United States were being installed in small town print shops. *The Printer's Miscellany* carried advertisements for second-hand models priced anywhere

67. Lucien Neipp, *Les machines à imprimer depuis Gutenberg* (Paris: Club bibliophile de France, 1951), pp. 36–53; Moran, *Printing*, pp. 105–13.

68. Neipp, pp. 63–64, 92–109, 221–27, 250–56; Moran, pp. 132–38, 157–60, 167, 170; Frank E. Comparato, *Chronicles of Genius and Folly: R. Hoe & Company and the Printing Press as a Service to Democracy* (Culver City, Nev.: Labyrinthos, 1979), p. 37.



Potter drum cylinder press. (Ringwalt, American Encyclopaedia of Printing*)*



Adams bed and platen press, invented c.1830. (Ringwalt, American Encyclopaedia of Printing*)*

from $800 to $2000. Some of these presses were still hand-cranked but increasingly they were run by 4 to 5 horsepower steam engines built by such companies as the Waterous Engine Works of Brantford, Ont. or by local machinists like W. D. Aitken of Saint John. By this time also printers were exploring electricity and gasoline engines as alternative power sources.[69]

Bed and Platen Press

The bed and platen press was an attempt to apply power and automatic inking to a simpler press than the initially expensive and complex cylinder machines. Retaining the horizontal bed and platen found on the hand press, make-ready and laying on of paper was similar to hand press work. Because of its simplicity and impression quality superior to early cylinder machines, the bed and platen enjoyed a certain popularity in the 1830–1880 period, especially for fine book work. The first bed and platen, a wooden press run with horse power, was conceived by the American Daniel Treadwell around 1820. Around 1830, two American brothers, Isaac and Seth Adams, built their own bed and platen that featured a stationary platen and a bed that was pushed up to meet it. Like Treadwell's, the Adams's press later substituted steam and iron for the initial manual power and wood construction. Capable of 500 to 1000 impressions an hour, the Adams press was popular and often-imitated in North America for fifty years. It was featured in the Montreal Type Foundry catalogue of 1865. At the time of Confederation George-Édouard Desbarats ran three Adams presses in his large Ottawa establishment, along with three Hoe cylinder presses. In 1859 the Adams plant and patents were purchased by the Hoe company. But the bed and platen was not, according to the modern authority on letterpress apparatus, "capable of very great development," and as cylinder presses were improved it fell into disuse.[70]

Platen Job Press

With the expansion of industry and trade, opportunities for job work increased. But the common hand press, let alone the huge cylinder machine, was too large for much job work like cards, handbills, bill heads and envelopes. The printer could print several jobs together in the form or use a small "card press." But in all cases the problem of slow operation in inking and laying on paper remained. After various attempts over the preceding decade, from 1850 onwards a number of special jobbing presses of a new design were introduced. On most, the type form was mounted in a vertical bed and the platen was hinged to the bed, opening and closing (like a book) to make the impression. Sheets were laid directly on the platen when it was in an open, nearly horizontal position. All such machines used treadle power and featured an automatic inking apparatus connected to the movement of the platen. In 1851 Stephen Ruggles of Boston introduced his "card and billhead press" that incorporated these features. But the same year George Phineas Gordon of New York patented a press that surpassed the Ruggles style in popularity and established the pattern for most subsequent designs. In 1856 Gordon incorporated a revolving ink disk to his press. Called the Franklin but popularly known by the inventor's name, the Gordon press captured much of the market and was often imitated in America and Europe over the following decades.

By 1894 at least eleven firms were building the Gordon and selling it to printing companies ranging from the very large to the smallest, undercapitalized "bedroom shop." Platen job presses left the operator with two hands free to rapidly feed and take off sheets. Operating this machine a boy could turn out 2000 impressions in one hour; with a hand press two pressmen could produce just 250 impressions in the same time. In later years, the use of steam or electric power and automatic feeding by sheets or web allowed the machine to turn out 5000 impressions in an hour. It is not surprising, therefore, that the jobbing platen has been called "possibly the most popular printing press during the last hundred years."[71]

It is not known when the first jobbing platen was introduced in Canada. In 1865 the Montreal Type Foundry was selling Gordon Franklin presses. By the late 1870s advertisements for various models, new and second-hand, appeared

69. Parker, p. 157; *PM*, various dates, 1876–1882; *MTF* (1865), pp. iii–v.
70. Neipp, p. 217–19; Moran, *Printing*, p. 113–21; Ottawa *Times* (21 Jan. 1869); Aach, p. 51; *MTF* (1865), p. iii.
71. Ralph Green, "A History of the Platen Jobber," in *Works of Ralph Green* (Cincinnati: Ye Olde Printery, 1981), pp. 3–33; Moran, *Printing*, pp. 143–155 (quote on p. 143).

regularly in the *Printer's Miscellany*. Among the models named were: Gordon No.2, Gordon Franklin, Liberty, Peerless, Kidder, Pearl, Universal, Berry, Favorite, and Little Favorite. Both large and small job printers found a ready use for them. *Printer's Miscellany* described the Peerless as "simple, strong, readily understood and easily operated." Of particular importance to the small shop, "any boy can understand and use it." But at the same time, one man could run up to six sophisticated Kidder presses when power and a reel feeding attachment were used.[72] The only obvious drawback to the jobbing platen was its well-known tendency to crush the fingers of its operators as they fed sheets onto the platen. The *Printer's Miscellany* ran several reports of apprentices' mishaps at the machine. James Fallis, a boy in McMillan's shop in Saint John, lost the top joint of one finger in the summer of 1877.

> *The first intimation the hands in the office had of the occurrence was by the lad running to the pressman and exclaiming: 'Oh, Charlie, stop my press, my finger's in it.' The press was immediately stopped, and sure enough there was the dismembered joint adhering to a piece of brass rule.*[73]

Young Fallis was more fortunate, however, than a boy in the Charlottetown *Patriot* office that summer, who "had his hand very badly smashed between the bed and platen of the Gordon press."[74]

Press Manufacturing in Canada

From time to time in British North America local machinists and foundries produced hand presses to order. But the sustained manufacture of presses seems to have begun only around the time of Confederation. As early as 1865 the Montreal Type Foundry advertised "Berry's Montreal Job Press." Designed and built by Montreal machinist and engineer William Berry, this machine resembled a platen job press but was hand cranked and ran at just 500 sheets per hour. In Oshawa at around the same time, the Joseph Hall Manufacturing Co. (a.k.a. Joseph Hall Iron Works) built copies of American hand, cylinder and jobbing presses. In 1877, faced with declining sales, it sold its press business to the McGill Manufacturing Co. of the same city. A year later, Westman & Baker of Toronto won a prize at the Provincial Exhibition for their version of the Gordon 'Improved' Franklin. It was the most notable press manufactured by Westman & Baker, who also produced Washington hand presses and bindery equipment. Forming part of their product line until the company closed in 1922, the jobbing platen was sold to print shops from Nova Scotia to the Yukon.[75]

Types and Type Founding

Until the 1830s text types were imported and were made in the way devised by Gutenberg. A punch cutter, a highly skilled independent craftsman, first cut a relief image of the letter by hand on the end of a steel punch. The punch was then hammered into the face of a small slab of copper to create a matrix, which was then fit into the bottom of a two-part, wood clad steel mold. Into this mold the type-caster poured molten type-metal, an alloy of lead, antimony and tin, gave the mold a jerk to fill all recesses of the matrix, then opened the mold and ejected the type onto a table. In this way a caster could make 4000 types a day (one every 10–12 seconds), but a large number of imperfect letters was unavoidable. The introduction in the 1830s of the lever mould for more quickly ejecting types and the hand-pump for injecting metal accelerated hand casting. The first type casting machine was introduced by George Bruce in the United States in 1838. By mechanically bringing matrix and mold up to a nozzle of a hot-metal pump and then automatically ejecting finished letters, this machine could produce 20,000 types a day. It formed the basis for subsequent improvements, which dressed and finished the cast type. By the 1860s type casting machines were in general use in the United States and Britain, almost halving the cost of type. Canada's only manufac-

72. *PM* (Oct. 1876), p. 43; *PM* (Nov. 1876), p. 57; *PM* (May 1877), p. 191; *PM* (June 1877), p. 225; *PM* (July 1877), p. 19; *PM* (Nov, 1877), p. 117; *PM* (May 1878), p. 304; *PM* (June 1878), pp. 339–40; *PM* (Oct. 1878), p. 129; *PM* (March 1879), p. 267; *PM* (July 1879), p. 2; *PM* (Sept. 1879), pp. 37–40.
73. *PM* (Sept. 1877), p. 65.
74. *PM* (Aug.1877), p. 36; the damaged fingers of jobbing platen operators warranted mention in Moran, *Printing*, p. 143.
75. *MTF* (1865), p. v; *MacKay's Montreal Directory* (1865–6); Parker, p. 158; Geoffrey Rider, "Westman and Baker, Makers," *Devil's Artisan*, 11 (1983), pp. 4, 7–14, 17; *PM* (June 1877), p. 218; *PM* (Feb. 1878), p. 213; *PM* (July 1880), p. 15.

IMPROVED GORDON PRESS.

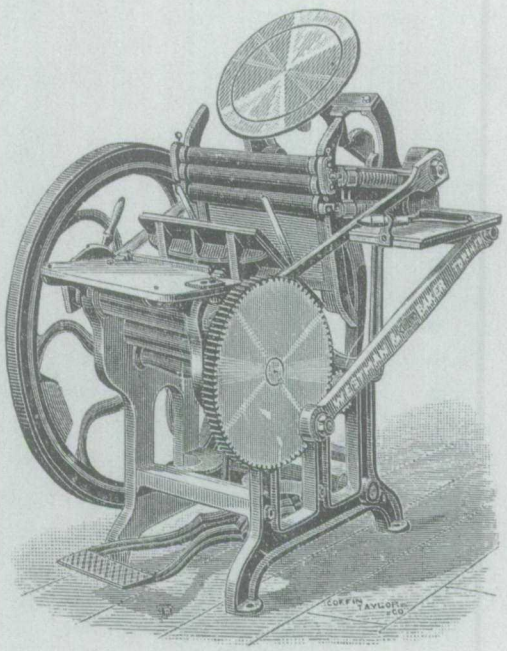
Strongest, easiest running and best job press in the world; movement perfection; steel shafts, steel pinion and steel draw bars; all parts interchangeable, and a perfectly noiseless press.

PRICES.

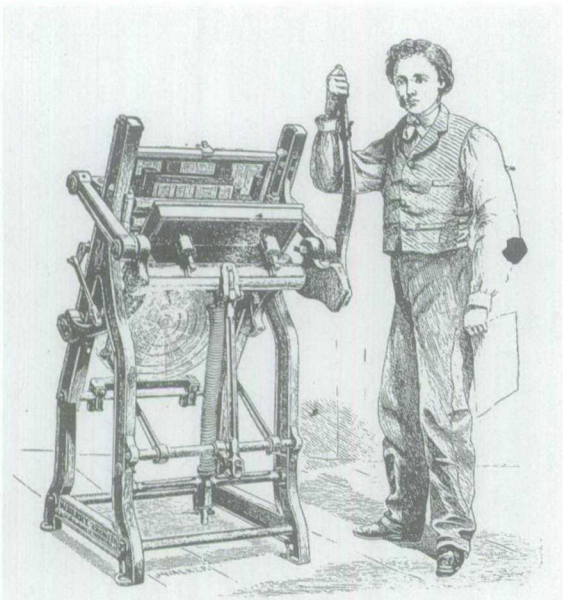
No. 1, 8×12 inside of chase . $160 00
No. 2, 10×15 inside of chase . 245 00
No. 3, 13×19 inside of chase . 320 00

Side Ink Plate, $1 50 extra; Steam Fixtures, $10 00 extra. Fountain for Nos. 1 and 2, $10 00 extra; No. 3, $15 00 extra.

Six roller stocks, three chases, one roller mould, one impression wrench, one gripper wrench and one hand roller go with each press.



Westman & Baker's Improved Gordon Press, a Canadian-made platen job press, introduced c.1878. (Toronto Type Foundry Catalogue, *1897*)



BERRY'S MONTREAL JOB PRESS.

Size No. 1:—Plates, 13 by 18 inches; Price, $165.
" " 2 " 14 " 23 " " $230.

Prints 500 sheets an hour, is worked easily by a boy, and will print proportionately faster when two persons are employed. Is strongly built, and will print a form as large as the chase will hold. The finest job work, plain or in colours, can be worked on this press.

Berry's Montreal Job Press, 1865. (Montreal Type Foundry Catalogue, *1865*)

MONTREAL TYPE FOUNDRY,

CHARLES T. PALSGRAVE, PROPRIETOR,

CORNER OF ST. HELEN AND LEMOINE STREETS.

PRIZE MEDAL,

CLASS XVII.

AWARDED

AT THE EXHIBITION

OF ALL NATIONS.

THE proprietor of this establishment avails himself of this opportunity to thank the PRINTERS OF CANADA for the liberal support which they have accorded him, and begs most respectfully to solicit a continuance of their patronage.

The Prices of **TYPES AND PRINTERS' MATERIALS** are the same as charged by the TYPE FOUNDERS of the United States, and being in connection with the principal MANUFACTURERS there, he can afford the CANADIAN PRINTER very great facility in the selection and receipt of such articles as are not manufactured here, including the

NEWEST STYLES OF FANCY LETTER

AND THE LATEST IMPROVED

FAST PRINTING PRESSES.

The PROPRIETOR thanks the PRINTERS of Canada for the praise they have, on so many occasions, bestowed on his Manufactures, and congratulates himself on the success of his efforts in the high reputation of his TYPE for DURABILITY and JUSTIFICATION.

The PRIZE MEDAL of the Exhibition of all Nations awarded to C. T. Palsgrave, and the CANADA DIRECTORY, printed from Type Manufactured at the MONTREAL TYPE FOUNDRY, are sufficient recommendations to the Printers of Canada.

MR. PALSGRAVE ACTS AS AGENT TO

E. R. Webb, Wood Letter Cutter,

GEO. MATHER AND J. D. McCREARY, INK MANUFACTURERS;

R. HOE & CO., AND A. B. TAYLOR & CO., PRESS MAKERS,

NEW YORK;

AS ALSO TO

RUGGLES' POWER PRESS MANUFACTURING COMPANY,

FAST JOB PRESS MAKERS, BOSTON.

Of whose manufactures he keeps a constant supply; and furnishes the Trade, should they prefer them, with the Manufactures of most of the Press Makers of the United States, at New York Prices.

A Branch of this Establishment at TORONTO under the management of Mr. D. K. FEEHAN, affords equally great facilities to the Printers of Western Canada.

Montreal, October, 1857.

Montreal Type Foundry, established c.1830. (Canada Directory, *1857–58)*

turer, the Montreal Type Foundry was using a type casting machine by 1863.[76]

Until the 1820s, most British North American printers imported their types from the William Caslon foundry in London. By the 1820s, American type founding had reached a scale and degree of maturity that firms began to expand outside local markets to sell through agents to frontier, and British North American, printers. William Lyon Mackenzie received annual shipments from New York foundries. Because type founding required considerable expertise and enough printers to provide a local market, it is not surprising that the industry was slow to be established north of the border.

Sometime in the 1830s, the Montreal Type Foundry became the first producer of type in British North America. Little is known about the history of this company in the 1830s, though under its later proprietor, Charles Theodore Palsgrave, it functioned until the early 1870s. An 1844 type specimen showed the company offering a range of body and display types and a small selection of rules, borders, ornaments and illustrations. In 1849 the company opened a Toronto branch to serve printers who had followed the Canadian capital from Quebec. At the Great Exhibition of 1851 the Montreal Type Foundry was awarded a medal. For a time the company benefitted from a 15 per cent duty on imported types. In 1865 it was also acting as the agent for Hoe and Gordon presses and for several foreign ink, paper and type makers. In about 1874, the Montreal Type Foundry disappeared and was apparently succeeded by the Dominion Type Foundry, also based in Montreal and claiming an ancestry dating back to 1830. The DTF was at this time still the only type foundry in Canada and carried out a general business in domestic and imported types, presses, and printers' supplies. The quality of its types was said to be superior to material done by the older Montreal firm. In fact one user, the Montreal *Star*, praised their durability, saying the company ranked "with the oldest and best foundries in the world." The DTF continued to operate until 1899.[77]

The early 19th century saw the introduction of a wide variety of bold and ornate display types for advertising purposes. These were found in increasing numbers in British North American publications by the 1820s and continued to be used for the rest of the century until typographical fashions swung to more austere designs. The design of these types, influenced by calligraphy, sign painting and engraved lettering, was a decisive break with the restrained classical faces used throughout the 18th century. With the introduction of the first "fat face" design, writes one historian,

> *... we have a face designed expressly for jobbing printing, not for book work, and one which is obviously intended to be neither normal, unobtrusive, nor beautiful, merely expressive. The new market, advertising printing, has been recognized.*[78]

The larger display types were difficult to make by the traditional method, and a number of techniques were used: sand casting; "dabbing" a wood or metal pattern in heat-softened type-metal to produce a matrix then striking the hardened metal matrix into similarly half-molten metal; cutting a brass stencil of the letter and mounting it on a brass base to form a "sans-pareil" matrix. The very largest letters were hand carved wooden types, but these could not be easily mass produced. This changed in the 1830s when in the United States identical wood types began to be produced by use of the routing machine (1828) and the pantograph (1834). For a time in the 1840s in Hamilton, U.C., a pair of Americans named Gay cut wood types by machine on maple wood. In the years before Confederation, the Montreal Type Foundry acted as agent for two of the most important American wood type makers, Wells & Webb and W. H.

76. Gaskell pp. 10–12, 207–8; "Montreal Type Foundry" [1863], reprinted in *Devil's Artisan*, 25 (1990), pp. 23–24.

77. Parker, p. 48; Rollo Silver, *Typefounding in America, 1787–1825* (Charlottesville: University Press of Virginia, 1965), p. 88; Fleming, "W. L. Mackenzie," II, p. 5; Elizabeth Hulse, "An Early Canadian Type Specimen Book," *Devil's Artisan*, 4 (1981), pp. 15–18; *MTF* (1865), p. i; Hulse, *Dictionary*, pp. 170–80, 200; *Canadian Printer and Publisher*, (Nov. 1899), p. 8; *PM* (Aug. 1877), p. 42; *PM* (Aug.1879), p. 24. Quote is from *Printer's Miscellany* (May 1878), p. 292.

78. Nicolete Gray, *Nineteenth Century Ornamented Typefaces* (Berkeley & Los Angeles: University of California Press, 1976), p. 11.

Page. Most wood type was cut on the end grain of a wood block. But in 1878 the *Printer's Miscellany* reported that E. F. Butler & Co. of Annapolis, N.S. had begun making wood type by jig sawing the letter from a thin veneer of wood and mounting it on a block. It is not known if this was a successful enterprise. In 1880, however, the U.S. manufacturer J. E. Hamilton took up this method and used it for almost a decade.[79]

Platemaking – Stereotype and Electrotype

During the first half of the 19th century printers adopted two techniques that involved printing not from types but from metal plates derived from impressions made on a type form. The advantages of stereotyping and electrotyping were numerous. By using plates the printer saved wear and tear on expensive types. Moreover, types once used to produce plates could immediately be reused for another project. The plates or their matrices, meanwhile, could be printed then stored for future use or sold to another printer. Finally these new techniques could produce multiple copies of plates, allowing for the same piece to be printed on several presses simultaneously, or for plates to be sent to widely dispersed printing centres. In short, platemaking techniques allowed a printer to rapidly produce large editions at lower cost, once initial composition and plate preparation was covered. It also allowed small printers in places like Canada to produce editions of popular or standard works from imported plates. In short, stereotyping and electrotyping formed two stars in the constellation of techniques and devices that allowed the mass production of printed matter at low cost.

Stereotype essentially involved making a plaster or papier mâché mould from the face of a type form and then pouring into it molten type metal. The finished plate after planing, trimming and mounting could be placed in the press and printed as usual. The term was coined by Firmin Didot of Paris in 1795 but the first European attempts at the method date from 1701 and possibly earlier.[80] But before 1800 the lack of demand for large editions discouraged printers from investing in the new process. In the first two decades of the 19th century in Britain, France, and the United States a few type founders and other entrepreneurs began to produce plates for large editions of standard works, especially the Bible. In 1829 a French printer, Claude Genoux, patented a new method that overcame the main disadvantages of plaster stereotyping—i.e. it was slow and required elaborate equipment, the mold broke in the process of separating it from the casting, and plaster fouled the types on which it was poured. Genoux used a matrix of wet papier mâché which he pressed into the type form and dried. He then placed the completed matrix between two iron plates and poured in molten type metal. Though incidental improvements were made in the technique, the principle of paper matrices, or 'mats,' dominated stereotyping from mid-century onward. Not only was it fast and cheap, but multiple plates could be made, and the finished mats were easily stored, transported, and handled. Though initially thought too crude for book work, stereotyping in this form was widely adapted for newspaper printing. This accelerated after a method for casting curved plates for rotary presses was developed.[81]

Electrotyping worked by taking a wax impression from the type face or a wood engraving. The impression was then brushed with graphite to make it conductive and placed as an electrode in a bath of copper sulfate or another electrolyte. A current run through the bath deposited over time a film of copper on the wax impression. When sufficiently thick, this deposition formed a plate that was an exact facsimile of the original. It could be separated from the mould, backed with molten type metal for support, and mounted on a block in readiness for the press. Electrotyping owed its existence to the widespread experimentation with electricity that was occurring everywhere in the mid-19th century. Men

79. Berthold Wolpe, ed., *Vincent Figgins Type Specimens, 1801 and 1815* (London: Printing Historical Society, 1967), pp. 9–15; Gaskell, pp. 207–9; Rob Roy Kelly, *American Wood Type: 1828–1900* (New York: VánNostrand Reinhold, 1969), pp. 36–59; Elizabeth M. Harris, *The Fat and the Lean: American Wood Type in the 19th Century* (Washington: Smithsonian, 1983), pp. 5–19; Hulse, *Dictonary*, p. 180; *MTF* (1865), p. i; *PM* (Nov 1878), p. 144; *Canadian Printer & Publisher* (Nov 1899), p. 8.

80. From Greek: *stereo* (rigid, solid) and *typos* (type, letter, character).

81. George Kubler, *A New History of Stereotyping* (New York: the author, 1941), pp. 23, 34–46, 58–59, 63–71, 75–78, 148, 153, 156, 168, 174–79; Silver, *Typefounding*, pp. 59, 64, 69, 76–79, 82; Gaskell, p. 201.

working in England and Russia in the late 1830s are credited with independently discovering its capabilities. In the the 1840s electrotyping was refined and developed as a viable industry. It was especially successful in the United States, where by the 1850s the Harper's establishment was printing most of their books and periodicals from electrotype plates. Electrotyping was slower and more expensive than stereotyping, but the resulting copper plate was much more durable. It was especially well-suited, therefore, to illustrations where fine detail was prone to wear in the press. One other notable application at the time was in the pirating of type matrices.[82]

Between 1828 and 1831, James Mcfarlane of Kingston printed editions of the *New Testament*, Mavor's *English Spelling Book*, and a popular cookbook from imported stereotype plates. This is the first known application of plate printing in Canada. By 1863 and possibly before, the Montreal Type Foundry was producing both stereoplates and electrotypes. The processes were not widely practiced in Toronto, apparently, before the 1870s. By 1876, however, the weekly edition of the *Globe* was being printed from stereoplates, and the daily edition followed a year later. At the end of the decade as the Toronto dailies installed web-fed rotary machines, they also set up stereotype departments to produce the curved plates needed for the new presses. There is little evidence of platemaking activity outside Montreal and Toronto. In 1876 a small, second-hand stereotype outfit was advertised for sale in Saint John, but it could accommodate no form larger than 6 x 9 inches. As late as 1882 the *Printer's Miscellany* wrote that any electro/stereotyper to set up business in Saint John would soon "command all the work ... in the Maritime provinces."[83]

Paper Making

Before the establishment of paper mills in British North America, printers imported their paper from Britain and by the 1820s, at least in Upper Canada, the United States. Initially this was the hand-made linen paper that had been produced in Europe for centuries. This same paper was produced by the first mills in British North America: the Argenteuil Paper Manufactory (1804) near Quebec City, the Acadian Paper Mill (1819) at Bedford, N.S., James Crooks's mill (1826) at West Flamborough, U.C., and Eastwood & Skinner's mill (1827) on the Don River near Toronto. It is notable that John Neilson financed the Argenteuil mill and that another printer, Anthony Henry Holland, established the Acadian mill. The two mills in Upper Canada were founded at least partly in response to a bounty of L125 offered by the Assembly, but received enthusiastic patronage from William Lyon Mackenzie despite delays in delivery and "detestable" quality.[84]

Early in the 19th century paper making underwent a major transformation with the introduction of machines. The first paper machine was designed in France in the 1790s to allow the paper manufacturers to dispense with the "skilled but rebellious" craftsmen central to production. This machine, whose principles are still found in paper machines today, was perfected in Britain between 1801 and 1807 by Bryan Donkin with backing from the stationers Henry and Sealey Fourdrinier. A vat fed a constant flow of "stuff"—a porridge of water and pulverized cloth fibre—onto a moving, continuous, woven wire belt. The film of stuff was then passed between two sets of rollers, over a felt belt and then between more rollers before being wound, as finished paper, onto a reel. By 1813, productivity in machine mills was 2 1/2 times that of hand mills, and the machines were being worked around the clock. By the 1820s machine-made paper production began to exceed hand-made paper for all but the fine papers.[85]

Canadian paper makers began to install machines in the 1830s and 1840s, the first known one being at the Eastwood & Skinner mill in Toronto in 1832. A second technological breakthrough came in the 1860s when manufacturers began to build mills that would make paper from wood pulp. This solved the chronic rag shortage that kept paper expensive. The first wood pulp mill in Canada used the soda process and was opened by Angus & Logan in Windsor

82. Gaskell, p. 106.
83. Parker, p. 75, 151; "Montreal Type Foundry," *Devil's Artisan*, 25 (1990), p. 24; *PM* (July 1876), p. 5; *PM* (Oct. 1876), p. 39; *PM* (May 1877), p. 193; *PM* (Sept. 1879), p. 40; *PM* (Aug. 1880), p. 18; Quote in *PM* (Feb./Mar. 1882), p. 101.
84. Parker, pp. 49–50; Fleming, "W. L. Mackenzie," II, pp. 8–9.
85. Gaskell, pp. 57–59, 214–20; *Penny Magazine* (Sept. 1833) in *Paper & Printing: The New Technology of the 1830s*, Colin Cohen, ed. (Oxford: Plough Press, 1982), pp. 11–16.

Mills, L.C. in 1864. Alexander Buntin opened the first groundwood mill at Valleyfield, Quebec later in the decade. The first mill to use the sulphite process did not open until 1888. Canadian mills in this period produced wrapping paper and news print; they made little or no writing and fine book papers.[86]

Ink and Inking

One historian of printer's ink has argued that "the discovery of oil-based ink by Gutenberg was just as important as his development of the use of movable metal type and the press."[87] This was because traditional thin, water-based writing inks would not adhere evenly to metal types but tended to "reticulate," or collect in globules on the type surface. For his ink, Gutenberg turned to recipes used in oil paints and printing on cloth. Until at least the mid-19th century black printing ink was made from these simple ingredients—primarily lampblack pigment mixed with a varnish made from boiled linseed oil to which rosin and other adjuncts had been added.[88] British North American printers imported all their inks from Britain and the United States until the time of Confederation. By the late 1870s, despite 17.5 per cent tariffs on their raw materials, Baylis, Wilkes Manufacturing Co. of Montreal and J. J. Smith of Toronto were supplying newspaper ink to the leading dailies in those cities.[89]

The implements of ink distribution, stuffed, hide-covered ink balls nailed to wooden handles, persisted for almost as long. If well made and the surface not damp or greasy, ink balls were effective, though slightly wasteful of ink. True, sheepskins were relatively expensive and their preparation, often left to the unfortunate apprentice, was time consuming and distasteful: before use, the sheepskins were rendered supple by soaking overnight in urine, followed by vigorous wringing. But the hand pressman working with ink balls could ink a form as fast as the press could be worked. This was not the case for the cylinder printing machines developed in the 1810s. These needed some form of automatic inking in order to realize the benefits of automating the impression process itself. A roller made from composition, a mixture of glue and molasses that could be cast in liquid form yet solidified to an slightly adhesive, elastic surface that took ink well, was patented in 1813 by Bryan Donkin and was used on Koenig's cylinder press built for *The Times* in 1813–1814. It was later improved by Augustus Applegath and by the end of the 1810s was being sold to other printers by Harrild's, a printer supply firm.[90]

The composition roller eventually had an impact on the hand press, both for the economic reasons stated above and because it made inking less physically demanding. The first rollers in the United States were imported from England in the mid-1820s. R. C. Benedict claimed that in 1831 at the Hastings *Times* in Belleville, U.C. he was the first in Canada to cast a roller from composition. Initially, printers mixed their own composition. But by the 1870s, they generally bought it in ready-made blocks, which they melted down and cast into rollers. By this time several Canadian firms were producing ready-made composition.[91]

Engraving and Lithography

Before 1840 most printed illustration was restricted to decorative borders, flowers and dashes and small generic blocks supplied by the type foundries. Found in commercial posters and broadsides through the entire 19th century, they formed with ornamental types the main visual effects available to the small job printer. At least from the late 18th century, foundry cuts were not original works but copies of wood engravings made by stereotyping. While not producing the fine lines of the original, stereotyping was an effective method of providing cheap, mass-pro-

86. George Carruthers, *Paper-Making* (Toronto: Garden City Press Co-Operative, 1947), pp. 300–1, 334–35, 414, 463, 513; Patricia Lockhart Fleming, "Paper Evidence in Toronto Imprints, 1798–1841," *Papers of the Bibliographical Society of Canada*, 19 (1980), pp. 34–35; *PM* (Mar. 1877), p. 134; *PM* (Sept. 1880), p. 42.
87. Colin Bloy, *A History of Printing Ink, Balls and Rollers, 1440–1850* (London: Wynkyn de Worde Society, 1967), p. 1.
88. Ibid., pp. 1–5, 15.
89. *PM* (June 1877), p. 218; *PM* (July 1877), p. 23; *PM* (Oct. 1877), pp. 80, 98; *PM* (Nov. 1878), p. 141.
90. Bloy, pp. 53–57; Gaskell, p. 126; Moran, *Printing*, p. 107.
91. Bloy, p. 60; Silver, *American*, pp. 58–59; *PM* (Sept. 1876), p. 24; *PM* (Jan. 1879), pp. 199–200; *PM* (May 1877), p. 190; *PM* (April 1878), p. 272.

duced images to printers. After 1840, type founders used electrotyping to reproduce cuts.[92]

Printing from designs cut in wood was an ancient art. Some woodcut and wood engraving was practised in British North America in the late 18th century. But the birth of a viable trade did not begin until the 1840s. In 1842, Nicholas Lowe began to practice the trade in Toronto, while in Montreal Adolphus Bourne advertised in that year that he would do wood engraving and lithography. Others followed during the 1840s and 1850s. Wood engravers found their bread and butter in commercial work—trade cards, bill-heads, building portraits, city views, etc.—and from periodicals. Up to the 1880s most commercial posters and broadsides relied more on typography than illustration for their visual effect. On the other hand, Canadian magazines and newspapers were faced with British and American competitors who used rapid cylinder presses and industrially produced wood engravings to splash their pages with illustrations.

In its simplest form, wood engraving consisted of carving a design on the end grain of a block of dense hardwood that would be placed in the form with type, inked, and printed. By drawing or transferring an image on the block then cutting away all white areas, the remaining high surfaces would receive ink and print black on the page. Wood cut printing has been in use since medieval times, though early cuts were made "on the plank" rather than at right angles to the grain. Through the mid-19th century in Britain and the United States this process was adapted to mass production. Pressmen learned to use dry paper and an elaborate make-ready to produce sharp, even images on the new, rapid cylinder presses then being introduced. Engravers, meanwhile, began to subdivide blocks for complicated works among several hands. The completed pieces were then bolted together to form a complete block. They also adopted routing and ruling machines to perform such painstaking and tedious jobs as cutting parallel lines for shading. To provide multiple and durable blocks, printers began to produce metal copies from the wood original by stereotyping and electrotyping. Finally, in the 1870s, engravers increasingly adopted photography to transfer images to wooden blocks. This foreshadowed the demise of wood engraving as a medium of realistic reproduction, once printers mastered techniques of producing relief metal blocks directly by photomechanical means. While outside Canada by mid-century an engraving was increasingly an industrial product made in large workshops, this did not occur in Canada until the late 1870s.

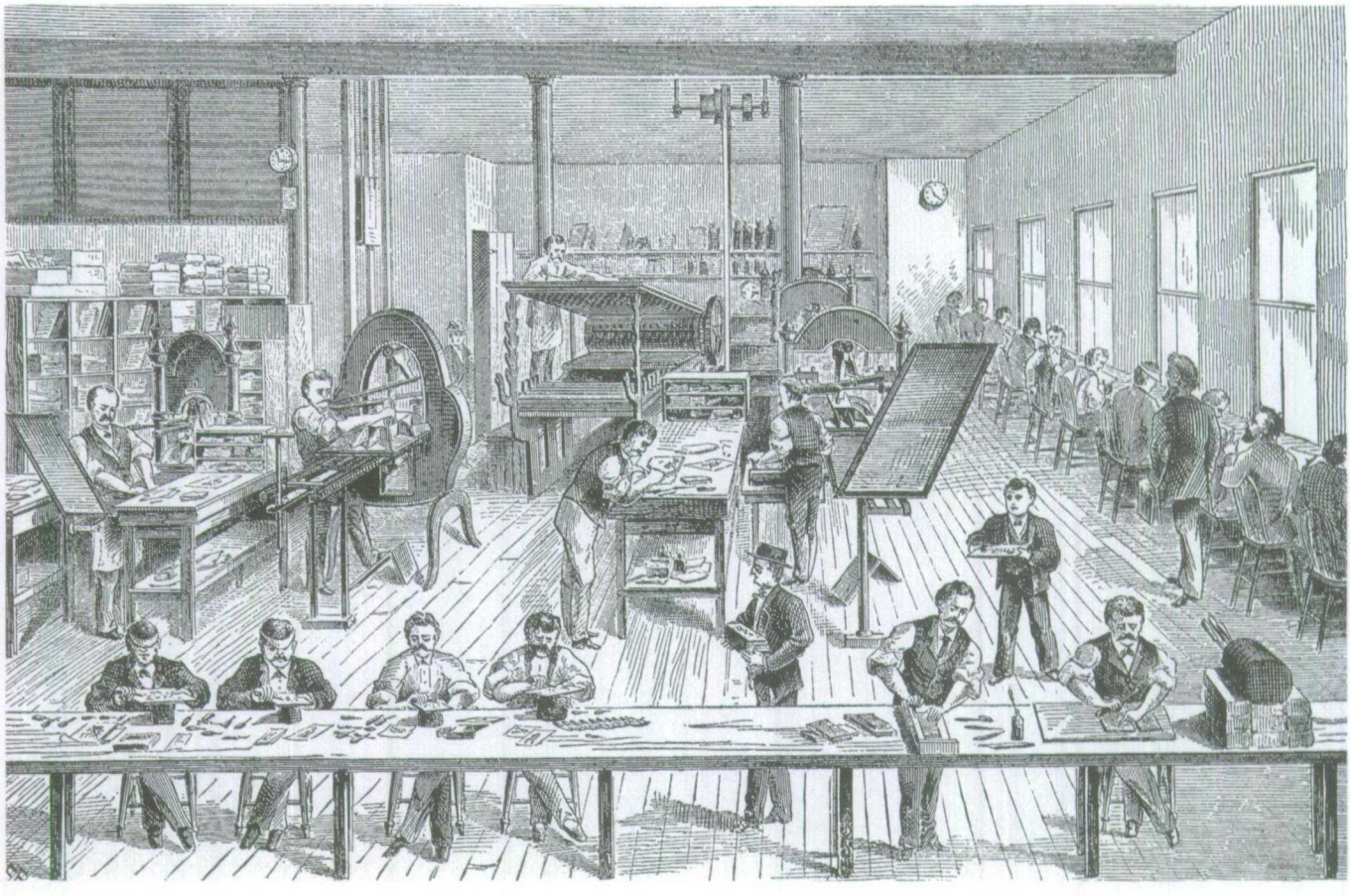
Today, the most well-known Canadian engraver of the period is J. H. Walker of Montreal. The mid-century Montreal engraving trade, though by no means lucrative or secure for all, was supported by book and magazine publishing. Walker executed many of the cuts in the *Literary Garland*, Lovell's Canadian school books, the *Canadian Illustrated News* and various newspapers and comic papers. In addition, copies of his cuts were sold by the Montreal Type Foundry. Perhaps his finest work was done for publications of the Geological Survey of Canada. Toward the end of his career, when ruling machines and photographic transfers were common, Walker expressed disgust at the work of his rivals:

> *... so far ... there is no sign of the spirit of art among them – cheapness – seems to be the object. One man has a machine – another says he has two machines and many pedals. A true artist, which a good engraver should be scorns machines in connection with his art, however usefull [sic] they may be and they are usefull in tint work, but it looks, to my eyes too manufacturing like to parade the fact ...*[93]

Printers, he believed, marred his own best cuts by careless stereotyping and sloppy presswork. By the late 1870s he said the best work in Canada was being done not in Montreal but in Toronto. But by this time the wood engraving trade had reached its peak. Picturesque Canada, a lavishly illustrated travel book issued in installments from 1882 to 1884, might be considered the culmination of wood engraved illustration in Canada. Ironically, most if not all the engravings were executed in the United States,

92. For examples of cuts produced by the Montreal Type Foundry see: *MTF* (1865), pp. 175–211. For more information on foundry cuts see: David Chambers, ed., *Specimen of Modern Printing Types by Edmund Fry, 1828* (London: Printing Historical Society, 1986), pp. 12–13; Carl Purington Rollins, ed., *The Specimen Books of Binny and Ronaldson, 1809–1812, in Facsimile* (Connecticut: Columbiad Club, 1936); Stephen O. Saxe, ed., *Old-Time Advertising Cuts and Typography: 184 Plates from the Boston Type and Stereotype Foundry Catalog (1832)* (New York: Dover, 1989), p. vii.

93. J. H. Walker, "Wood Engraving in Canada," [1886] *Journal of Canadian Art History*, 8,2 (1985): p. 183.



Wood engravers at work, mid-19th century.

then electrotyped and printed in Montreal. From the mid-1880s, as elsewhere, wood engraving lost ground to photomechanical relief processes and to lithography.[94]

Another centuries-old technique for producing multiple images was the use of engraved metal plates. Gravure or intaglio printing was as old as printing from movable types, and until the development of photographic processes its techniques were little changed. The basic principle was to engrave with a burin or etch with acid a design into a thin plate of copper or steel. The printer then inked the plate, afterwards scraping it to leave ink only in the incised grooves. Placing wet paper over the plate the printer then fed both through a special press that squeezed plate and paper together between two rollers, effecting the transfer of ink from the grooves to the paper. Plate printing was usually carried out by specialists as a separate trade from letterpress printing. Because it could render very fine details, intaglio was preferred over wood cuts and engravings for fine art reproduction, map making and technical illustration. It was also used to produce banknotes, certificates and other fine commercial work.

By the mid-19th century few technical changes had been introduced to this trade. Various methods of producing tone on the plate—eg. stipple, aquatint and mezzotint—allowed for the more faithful reproduction of artworks. Ruling machines were developed to allow mechanical production of lines. The replacement of easily worn copper plates by more durable steel and then their replacement by copper plates faced with steel allowed for longer press runs. Gears were added to the wooden rolling press and iron presses were introduced, both innovations allowing greater and more even impression power with less weight and effort.[95]

Research on the history of engraved and etched prints in Canada has emphasized the pictorial as opposed to the job side of this trade. The first confirmed illustrations from metal plates appeared in Quebec City in 1792–93 when Samuel Neilson printed line etchings, aquatints and line and stipple engravings executed by local craftsmen. These rather inexpert works appeared in the *Quebec Magazine* and the *Quebec Almanac* or were issued as separate sheets to be either sold or given as bonuses to subscribers. Between 1800 and the 1830s sporadic etching and engraving activity by professionals and amateurs occurred in Halifax, Quebec and Montreal, the most common pictorial works being city views and portraits. No printer or engraver could survive on pictorial work alone. Most supplemented their incomes with commercial work, silver engraving, portrait painting, or other means, including wood engraving and lithography.[96] Until the 1840s, no engraving or plate printing at all was done in Upper Canada. Any commercial work, of banknotes, etc., was obtained from Albany or New York City. In the 1830s, copper plate printing for separately issued prints was supplanted in Canada by lithography. Commercial work persisted, though the tendency for firms to advertise engraving in wood and metal and lithography services makes it difficult to determine how much intaglio work they did. The existence of bank note engraving establishments in Ottawa in 1871 and Montreal in 1881 testifies to the continued application of intaglio in this specialized field.[97]

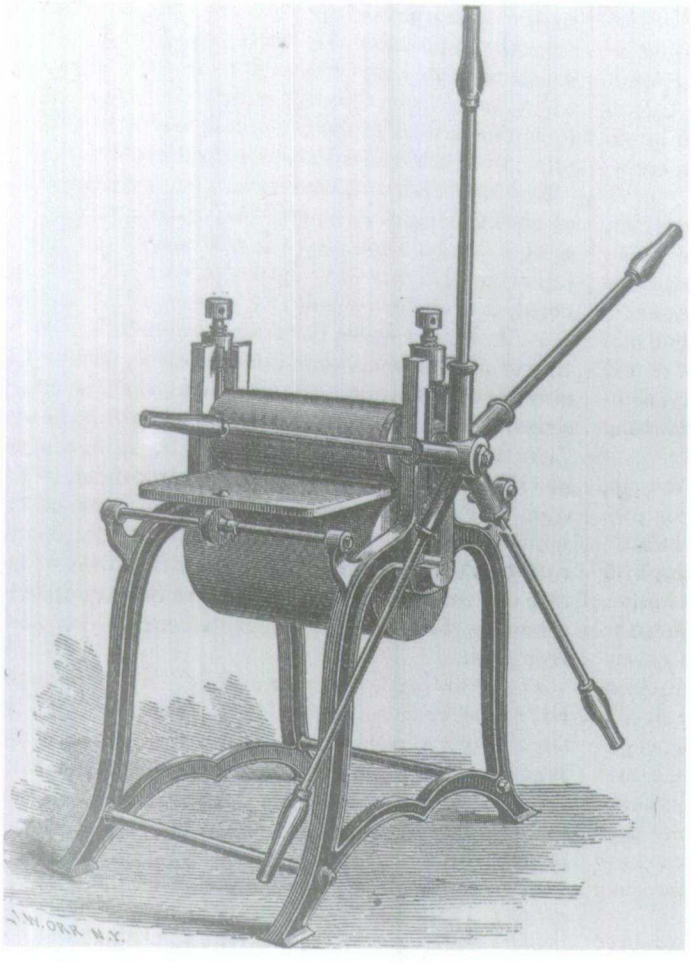
Lithography first appeared in Canada in the 1820s, when military printers in Fredericton and the Royal Engineers' Office in Quebec City pro-

94. *PM* (Sept. 1876), p. 27; *PM* (Jan. 1878), pp. 162, 178; *PM* (Oct. 1880), p. 50; Walker, "Wood Engraving in Canada" [1886], pp. 180–85, 203; Yves Chevrefils, "John Henry Walker (1831–1899), Artisan-Graveur," *Journal of Canadian Art History* 8,2 (1985), pp. 206–12; *MTF* (1865), pp. 183–85; 189, 192, 195, 198–99; Allodi, p. 87; Mary F. Williamson, "'Description Fails ...' Periodical Illustration in 19th Century Ontario," in *The Art and Pictorial Press In Canada: Two Centuries of Art Magazines*, Karen McKenzie and Mary F. Williamson, eds. (Toronto: Art Gallery of Ontario, 1979), pp. 11–15; Albert Moritz, *Canada Illustrated: The Art of Nineteenth-Century Engraving* (Toronto: Dreadnaught, 1982), pp. 8, 19–23; Parker, p. 50. On the industrialization of wood engraving, see: John Buchanan-Brown, "British wood-engravers c. 1820–1860: a checklist." *Journal of the Printing Historical Society*, 17 (1982/83), pp. 31–36; Geoffrey Wakeman, *Victorian Book Illustration: The Technical Revolution* (Newton Abbot, UK: David & Charles, 1973), pp. 73–81; "The Growth of Wood-cut Printing: the Modern Method of Machines, II," *Scribner's Monthly*, 20 (1880), pp. 39–43.

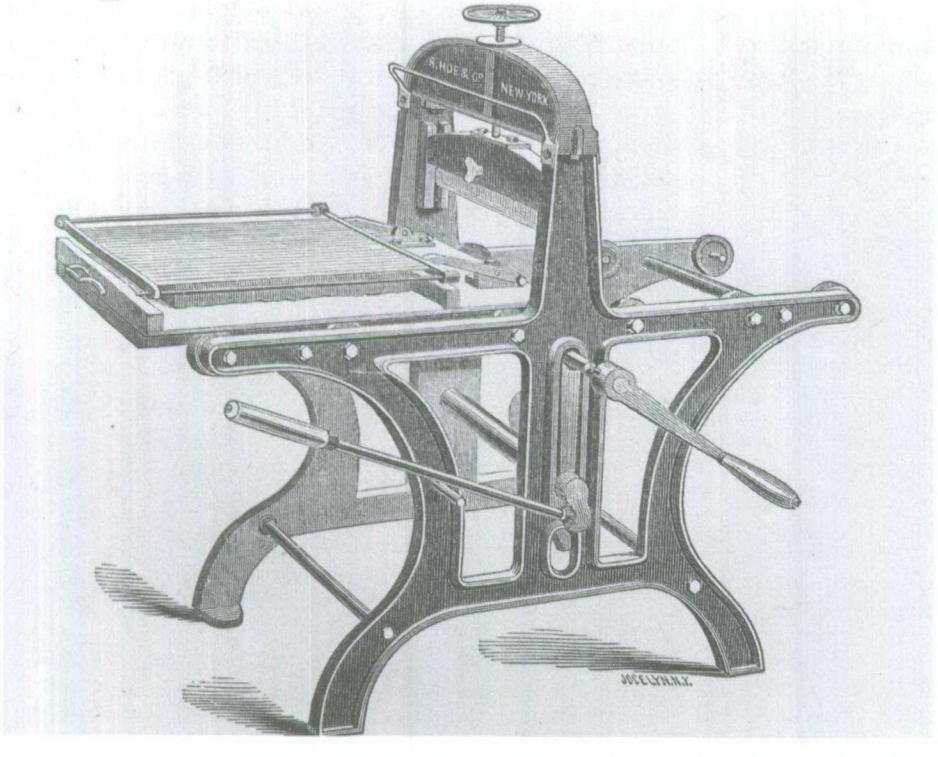
95. Anthony Dyson, *Pictures to Print: The nineteenth-century engraving trade* (London: Farrand Press, 1984), pp. 102, 106–11, 113–139.

96. Even in a rich market like London, England, engravers executed everything from art reproductions to maps, stamps and bull-heads. Many also worked in lithography and wood. See Dyson, p. 31

97. Allodi, pp. xiii–xvi, 4–23, 27–47, 62–79, 163–4; Canada, *Census* (1871), v.3, Table 53; Canada, *Census* (1881), v.3, Table 54.



Gravure hand press. (Ringwalt, American Encyclopaedia of Printing*)*



Lithographic hand press. (Ringwalt, American Encycolpaedia of Printing*)*

duced copies of maps, plans, and landscape sketches for official purposes and some private use. This followed the same pattern of introduction of the technique as in Britain in the previous decade. In 1831 two commercial lithographic presses were established, one by Adolphus Bourne in Montreal and the other by Samuel Oliver Tazewell in Kingston. The following year, J. Wilson opened another shop in Montreal and Tazewell moved his outfit to York.

Over the next twenty years, the production of pictorial prints increased dramatically, due both to population increase and to the easier and cheaper printing technique offered by lithography. The first important book with lithographed illustrations was probably Newston Bosworth's *Hochelaga Depicta*, published in 1839. For commercial lithographers, pictorial prints were only one aspect of a general job business that also included engraving in metal and, from the 1840s, in wood. The output of these firms included book and magazine illustrations, maps, sheet music, trade cards, portraits, forms, bills, labels and other job work.[98]

The appeal of lithography over engraving in wood or metal was speed, versatility and, at least in theory, that the only skill required was the ability to draw. Any visual effect painstakingly achieved with graver or burin by a skilled engraver could be quickly imitated by the lithographer. Moreover, chalk or wash effects could be displayed in no other way. When compared to letterpress, lithography offered a far broader range of visual styles, as it was limited only by the skill and imagination of the artist, rather than the selection of the type catalogue. Lithography was thus from the beginning conceived as a rival to existing forms of printing.

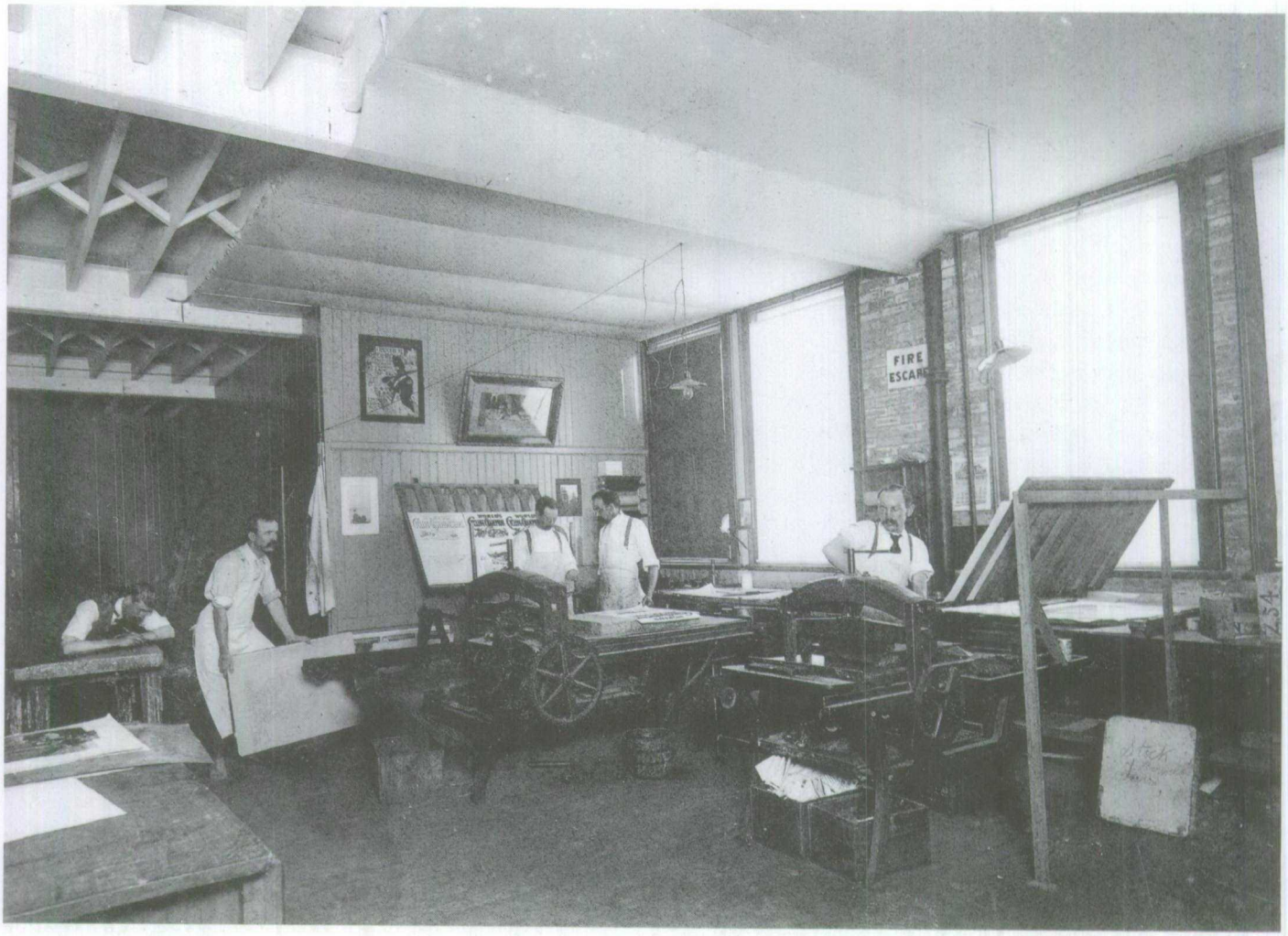
Invented by Alois Senefelder of Munich in 1798, lithography worked on the mutual repulsion of grease and water. Unlike intaglio and letterpress, it did not depend on the inked printing surface being on a different elevation to the surrounding plate or block. Instead, the lithographer applied the image to polished, fine grained limestone (or to zinc or aluminum) with grease pen, pencil, or chalks. Alternatively, a drawing on paper in these media could be laid face down on the stone and transferred to it. After fixing the image with a wash of gum arabic and dilute nitric acid, the lithographer dampened the stone with water and spread on it an oil-based ink. The ink adhered to the drawn-on image but was repelled by the water that had seeped into the rest of the stone. The lithographer then took an impression by laying paper over top of the stone and applying pressure with a scraper. Until 1850 the press was a hand press of various designs and built of wood or iron. Most worked by running the paper and stone under a stationary scraper by means of a lever or star wheel. Presswork was slow, however. Even the simplest line drawing could not yield more than 100 prints per hour.

When power operated presses were introduced after 1850, an impression cylinder was substituted for the scraper. These new presses also featured automatic damping and inking and mechanical laying on and taking off of paper. With these innovations, lithographers could take off in one hour 800–1000 impressions, the product of four days at the hand press. This assured the commercial survival of lithography as a competitor to letterpress. A further breakthrough coming in the 1830s was chromolithography, the printing of colour images from several stones. The combination of steam operated presses and colour printing opened new markets for lithographers in the mass production of art prints, advertising posters, and business stationery.[99]

Though steam powered presses were introduced in Toronto, Montreal, and Saint John, Canada before 1880 did not develop the large lithography industry that in the United States churned out thousands of chromolithographs for the mass market. Most advertising posters still relied on decorative wood types and wood engravings, and the Canadian market was simply too small to sustain a local industry in pictorial prints. But several commercial lithographic firms were established that in later years dominated the Canadian industry. In Toronto, the lithographic business begun by Hugh Scobie in 1843 evolved into Maclear & Co. (1854–1861), W. C. Chewett & Co. (1861–69) and finally Copp, Clark (1869–). John Ellis, who had been engraving and lithographing since about 1843 sold his Toronto business to Joseph T. Rolph in the

98. Allodi, pp. xiii, 80–81, 85–86, 91–92, 145, 173, 189, 201; Moritz, p. 20.

99. Twyman, *Lithography*, pp. 3–5, 11, 160–2; Michael Twyman, "The Lithographic Hand Press, 1796–1850," *Journal of the Printing Historical Society*, 3 (1967), pp. 10–11, 42, 49–50; Peter Marzio, *The Democratic Art: Pictures for a 19th Century America (Chromolithography, 1840–1900)* (Boston: David R. Godine, 1979), pp. 4–8, 14–17.



Lithographers at work, Toronto Lithographing Co., 1898. (City of Toronto Archive, SC 137-13)

1860s. Rolph was later a partner in Rolph, Smith & Co., a forerunner of Rolph-Clark-Stone. Three important Toronto firms were established in the 1870s: Rolph, Smith & Co., Toronto Engraving Co. (later Brigden's) and Toronto Lithographing Co. (later Stone Ltd.). Also in Toronto in the 1870s, a publishing landmark was made with the first publication of *Grip*, a weekly comic paper established by J. W. Bengough. He exploited the freedom and speed offered by lithography to print his political cartoons. His firm evolved into Bengough Bros. and then the Grip Printing and Publishing Co.

The output of these firms bore a striking resemblance to that of engraving and letterpress shops. An 1865 advertisement for W. C. Chewett & Co. listed the wide range of lithographic products it offered:

> *Maps, Charts, Debentures, Bankers' Cheques, Promissory Notes, Drafts, Bill Heads, Business and Visiting Cards, &c.... A Stock of Labels for Druggists, Brewers, grocers, &c., kept on hand.*[100]

Chewett were also known to have produced covers for sheet music. In Chewett's and most other cases, however, lithography formed only part of the business of these firms. They also dealt in wood engraving and in letterpress job printing and in stationery. Among their commercial work, Rolph, Smith and Toronto Litho. both printed county atlases, which enjoyed great popularity in the 1870s and 1880s.[101]

Above all, lithography was tied to the need for advertising and packaging. *Printer's Miscellany* noted in 1878, during a period of economic depression that:

> *... to a far greater extent than typography, lithography is effected [sic] by the prevailing state of trade. The latter art is so much adapted to produce the wrappers in which manufactures are sold, or the show-cards by which their merits are brought to public notice, that any increase of activity in the cotton, lace, hardware or other businesses influences directly the lithographic offices and the market for lithographic labor.*[102]

Perhaps because it invaded their markets lithography was simultaneously disdained and feared by some within the more established engraving and letterpress trades. One craftsman argued that, despite great advances in chromolithography

> *No one with any pretensions to literary or artistic taste could pretend that it has equalled, or shown any likelihood of equalling, the delightful acquatints which became popular ... at the end of the last century and the beginning of this.*[103]

The editor of the *Printer's Miscellany* wrote that, unlike engraving, lithography could not and might never match the "emphatic outline" and sharp definition of typography. Letterpress also excelled the newer technology in speed and ease of duplication. The writer proceeded, however, to lament the low quality of typography in Saint John and ask rhetorically,

> *How is it that so much of our fine work at present goes to the lithographer, when the lithographer himself will admit that it could be done cheaper and better on the printing press?*[104]

Despite the competition, until the mid-20th century letterpress would indeed hold its own against lithography in newspaper and general job printing.

The Printing Life

The work of the print shop has historically been divided into two activities, composition and presswork. In many small shops before 1880 and after, individual printers were expected to perform both tasks. Composition demanded a combination of dexterity, design skill, and mental ability. Hand presswork required strength, endurance and care for details of register and impression. After the introduction of cylinder presses, the pressman's job came to demand more specialized skill, both in making the press

100. McLeod, p. 24.
101. *PM* (July 1877), p. 6; *PM* (Feb.1878), p. 209; *PM* (Aug. 1879), p. 21; Robert Stacey, *The Canadian Poster Book: 100 Years of the Poster in Canada* (Toronto: Methuen, c. 1980), pp. 10, 34–35; Hulse, *Dictionary*, pp. xi, xiv; McLeod, p. 13–17, 24; Carl Spadoni, "*Grip* and the Bengoughs as Publishers and Printers," *Papers of the Bibliographical Society of Canada*, 27 (1988), p. 18; Angela Davis, "Business, Art and Labour: Brigden's and the Growth of the Canadian Graphic Arts Industry, 1870–1950" (Phd Thesis, University of Manitoba, 1986), pp. 86–88.
102. *PM* (March 1878), p. 223.
103. *PM* (April/May 1882), p. 123.
104. *PM* (Aug./Sept. 1881), p. 20.

ready to print and in maintaining the complicated apparatus. Both composition and presswork were carried out over a regular day that in the 1830s extended to ten hours, six days a week. In 1872 one of the most important struggles in Canadian labour history was successfully fought in Toronto to reduce the work day to nine hours. But other Canadian centres continued to operate on the ten hour day until 1898.[105]

Both composition and presswork were generally considered man's work. Some women were employed as press feeders after the introduction of cylinder machines, and female compositors were employed by some printers. In 1876, for example, the Montreal *Witness* employed 16 women in the composing room, while at around the same time there were 16 female compositors in Charlottetown. Unlike their male counterparts, however, women generally had not been granted a formal apprenticeship in all aspects of the trade and were thus not accepted as journeymen or as union members. They usually received lower wages for their work, and it was assumed their employment was a brief interlude between childhood and marriage.[106]

In an age when literacy was not universal, compositors found it a requirement of the job. Compositors were often responsible for proper spelling and punctuation where the original copy was deficient. They also had to have a sense of design, as graphic design would not emerge as a distinct trade until the end of the 19th century. Compositors stood before their cases[107] of types and, as they read a few words of the copy to be printed, they picked up the loose types, letter by letter, and placed them in a narrow, ruled composing "stick" held in the left hand. Experienced compositors had no need to look as they placed the type on the stick, knowing by feel when the type was positioned correctly, and thus were already looking for the next letter as they placed the first. At they neared the end of a line, indicated by ruled marks on the stick, compositors "justified" the types by placing extra spaces between words so that the final word came to the very end of the line. This ensured the right margin of a column of type was straight and not ragged. After composing a few lines on the stick, compositors transferred the types to a metal tray called the galley. After a page or column had been assembled, the galley was inked and a proof taken from which errors could be found and corrected. The corrected galley was then tied up with string and set aside, preparatory to being locked with other pages in a "chase" that when complete was the form for a full sheet ready for printing. After printing, compositors returned or "distributed" the types to their cases. One printer estimated that in setting up and distributing a column of type, the compositor's hand would travel thirteen miles.

Until the mid-19th century, the compositor was generally paid by a piece rate according to the amount of type he or she managed to set. Because the compositor was not paid for time doing corrections, or for time spent distributing type, the successful compositor combined accuracy with speed. In the course of the 19th century, commercial printing came to use larger and more ornamental display types. The compositor could set such display matter much more quickly than for the "straight" matter found in newspapers. Employers, therefore, adopted the practice of paying commercial compositors by time at a rate equivalent to the piece rate performance for straight matter of a competent compositor. Within newspapers, unions struggled to ensure that the "fat" matter of display advertising was equally distributed among their piece work members.[108]

Regardless of the undeniable skill and efficiency of the experienced compositor, the *Penny Magazine* could still write in 1833 that:

> *... the setting up of types, one by one, so as to produce syllables, words, sentences, paragraphs, chapters and*

105. F. H. Armstrong, "Reformer as Capitalist: William Lyon Mackenzie and the Printers' Strike of 1836," *Ontario History*, 59,3 (Sept. 1967), p. 193; Gregory S. Kealey, "Work Control, the Labour Process, and Nineteenth-Century Canadian Printers," *On the Job: Confronting the Labour Process in Canada*, Craig Heron & Robert Storey, eds. (Kingston & Montreal: McGill-Queen's University Press, 1986), pp. 88–89.
106. *PM* (Sept. 1876), p. 23; *PM* (Sept. 1877), p. 59; *PM* (Nov. 1877), p. 104; *PM* (May 1878), p. 287; *PM* (July 1878), pp. 14–15; Christina Burr, "'That Coming Curse – The Incompetent Compositress': Class and Gender Relations in the Toronto Typographical Union during the Late Nineteenth Century," *Canadian Historical Review*, 74,3 (Sept. 1993), pp. 352–57.
107. The origin of the publishing terms "upper" and "lower" case derives from printing practice, where the case holding capital letters was placed above the one for small letters.
108. Gaskell, pp. 43–54; *PM* (April/May 1882), p. 126; Zerker, pp. 14–15.

books, is essentially a slow operation, — a much slower operation than copying with a pen, — an operation worthless except if were possible and desirable to produce many copies from the types thus set up.[109]

Hand presswork, which usually required two operators, involved a series of distinct tasks. Prior to printing, one hand busied himself with working up the ink, spreading it on an ink block and, before the adoption of ink rollers, "knocking up" the ink balls—two sheepskin or stuffed leather pads mounted in wooden cups and handles—used to distribute ink over the types. The other more experienced hand placed the form on the press and set up the tympan to ensure that the paper would lie in the proper position, in "register," over the form and cut a frisket from paper or parchment to lie over the paper, protecting those areas not to be printed. Finally, he "made ready" the form and tympan to ensure an even impression by underlaying any low types or blocks on the form with pieces of cardboard and "packing" the tympan behind the paper with damp cloths, or "blankets," to ensure that the type would be pressed far into the paper. With worn types of uneven height, the norm in most British North American offices, the tympan was packed loosely, while with new types a harder packing was used. Loose packing, though giving a slightly blurred impression, required less skill and time in the make ready. For fine printing hard packing was used, along with overlaying, the pasting of thin sheets of tissue to the tympan behind the paper to push the paper in those areas down onto low points on the form. The increased precision of the iron press required hard packing and the use of overlays in the make ready.

The two hands alternated at the two tasks of printing itself. The "beater" spread a dab of ink over the ink balls and before each impression distributed it back and forth over the form with a rocking motion. After the adoption of ink rollers this task was simplified. The "puller" picked up a clean sheet off the heap, laid it in the tympan, folded the frisket over it, swung the unit down over the form, turned a crank, or "rounce," to bring the first half of the form under the platen, pulled the bar to make an impression, returned the bar, turned the crank again to bring the second half of the form under the platen, pulled the bar again, and then turned the crank all the way back to bring the form away from the platen. Iron presses eliminated the need for a second pull and returned the bar to the starting position automatically by the use of springs. Tympan and frisket were then flipped back and the paper was removed. In this manner the two pressmen could print about 200–250 sheets on one side per hour, or one sheet every 14–20 seconds. Like composing, hand presswork was paid according to output.[110]

The introduction by employing printers of the cylinder machine transformed the labour process in the printing industry. The pressman, once known mainly for a strong arm, now became responsible for a complicated and tempermental piece of machinery. In addition to tending to the special needs of the new machine, the pressman continued to practice "the mysteries of make ready," ensuring even impression by underlaying the type form and packing and overlaying the cylinder. The pressman was no longer much concerned with feeding or taking off sheets. In the large, industrial shops this menial work, whose pace was set by the shuttling of the machines, was performed now by unskilled, unindentured labourers—boys, men or women—who were destined never to become journeymen.[111]

In the small shop in British North America the master printer did much of the composing and presswork himself, both because of the shortage of work and because of the shortage of workers. His wife and children could be called upon to help, and, in fact, widows of printers were known to carry on their husbands' businesses.[112] The two other sources of labour were apprentices and journeymen. Apprentices were bound to their masters as boys for a variable number of years starting at age 13 to 15 and finishing at age 21. In return for room, board, lodging and instruction in the trade, the boy's parents bound him to the master to work out his indenture for minimal or no pay. In the shop, the young apprentice worked long hours at the most menial and odious tasks and was the butt of abuse from the journeymen and older apprentices. Early apprenticeship contracts contained moral strictures that the boy act with absolute faithfulness and obedience to his master and, in the words of the

109. *Penny Magazine* (Nov 1833), in Cohen, p. 26.

110. Gaskell, pp. 126–30, 200; Wroth, pp. 80–81; Moran, *Printing*, pp. 32–34.

111. Moran, *Printing*, pp. 168.

112. Parker, p. 44.

indenture agreement of young Henry Chubb of Saint John, N.B. in 1801, "not commit Fornication nor contract Matrimony within the said Term: at Cards, Dice or any other unlawful Game he shall not play ... nor haunt Ale-houses, Taverns or Play-houses ..."[113] By the 1820s, however, these constraints had disappeared from the indenture agreements entered by William Lyon Mackenzie, replaced by a simple contractual exchange of services.

Clearly, employers gained from the apprenticeship system a source of cheap, available labour. But aside from immigration of experienced journeymen, apprenticeship was also the only means by which print shop owners could provide themselves with skilled workers. Samuel and John Neilson's Quebec shop trained many printers who went on to establish their own presses elsewhere in British North America. And Mackenzie's agreements included a promise to keep on his apprentices as journeymen after the expiration of their indenture.[114]

The apprenticeship problem became one of the most vexatious issues of the latter half of the nineteenth century. The problem was that the customary regulation of apprenticeship had broken down and had not yet been replaced by anything else. Interested in cheap labour, master printers took on as many apprentices as they could. What followed is best described by a correspondent to the *Printer's Miscellany*:

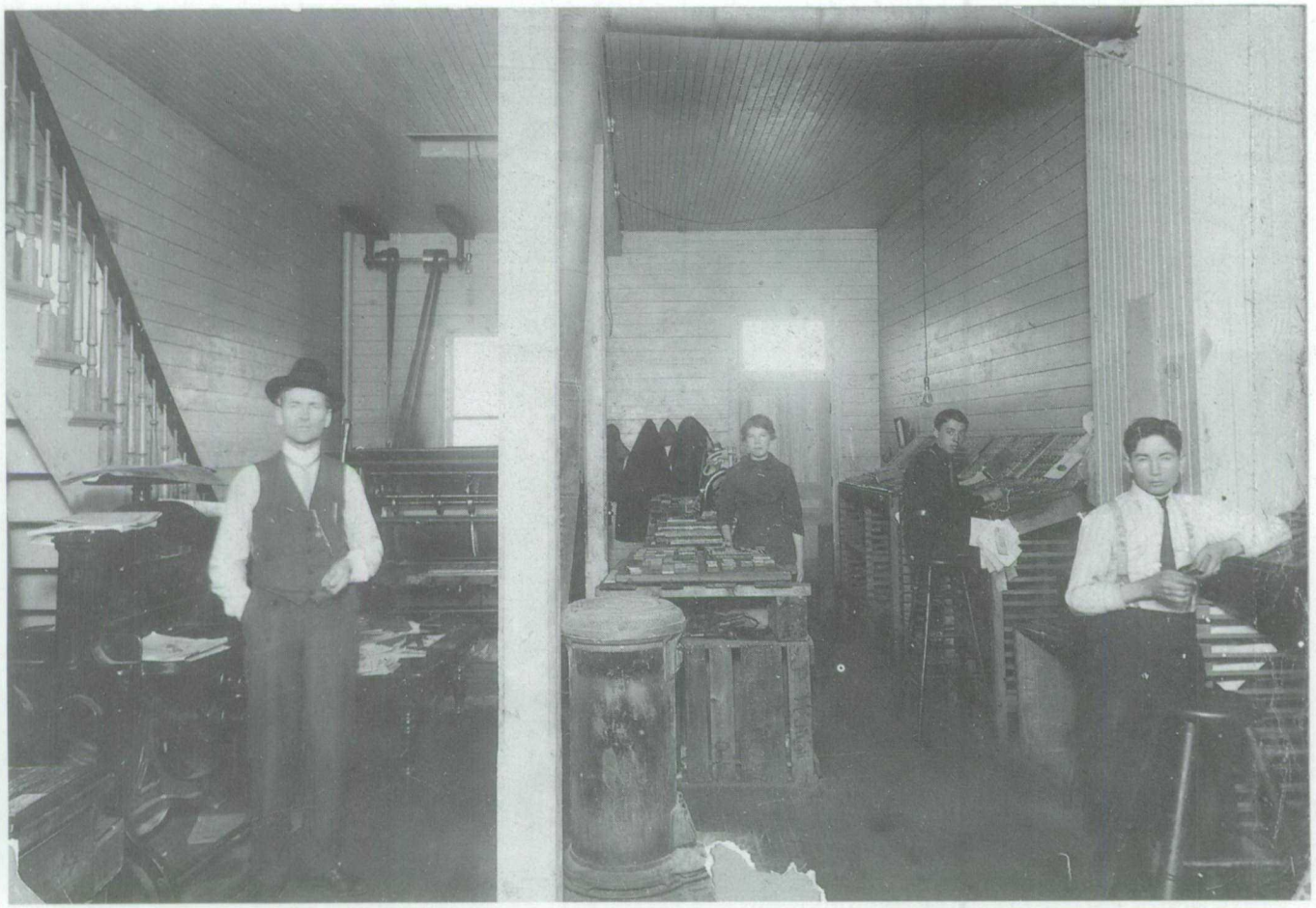
> *A boy of fifteen goes into an office, learns the boxes, and is taught the mysteries of 'following copy.' He acquires a little speed, gets the big head, has a fuss with his employer, quits the office and starts on the 'tramp' as a full-fledged journeyman printer. The country is overrun with such fellows.*[115]

Too often they swelled the ranks of the unemployed, who in this period of history roamed from town to town seeking temporary employment. Such "half-way" journeymen, most of whom had not worked long enough at the trade to become competent, became "roving botches." Turned away disappointed at so many shops, they became "discouraged, reckless and dissipated," indulging the printers' traditional weaknesses for wander and drink.[116] During strikes in city shops, journeymen were angered to see employers bring in ill-trained "country mice" to take their jobs. Printers' unions at the local and international level were unanimous in calling for restrictions on the number of apprentices per shop and on enforcing a five year apprenticeship during which master and apprentice were bound by a legal indenture.[117]

Apprenticeship was one of several issues that sparked the formation of printing trade unions in Canada. By the time that printing was established in British North America, journeymen printers in Britain and the older American colonies had already developed traditions that celebrated their skill and glorified their trade for its literacy and for its product; printed matter was a token of knowledge and a weapon of liberty bestowed on the world. In Britain, the journeymen in each shop organized themselves into a "chapel," which provided benevolent services for sick and deceased members and governed, through the use of rituals and fines, the behaviour of members in the shop. These chapels also represented the men in their dealings with the master. Though they were not trade unions in the modern sense of being collective bargaining agents, the chapels did provide a sense of collective discipline and solidarity that would later prove so useful in the organization of unions. And for decades printers were, by virtue of their literacy, organizational experience, and self-confidence, in the forefront of the craft union movement.[118]

The first formal printers' unions in British North America, in Quebec, Montreal, Hamilton, Toronto, and Halifax were formed in the 1820s and 1830s. Though most were short-lived, permanent organizations were in place by the 1860s. Unions were founded on the recognition that, whatever the traditional bonds between master and journeyman in pre-industrial times—when master printers began their careers as journeymen—by mid-century the interests and employer and employed were no longer identical.

113. Parker, p. 44.
114. Wroth, pp. 154–8; Silver, *American*, pp. 1–5; Thompson, p. 11; Parker, pp. 44–45; Patricia Lockhart Fleming, "A Canadian Printer's Apprentice in 1826," *Devil's Artisan*, 9 (1982), pp. 13–16; Tremaine, *Canadian*, p. 31.
115. *PM* (May 1877), p. 180.
116. Ibid.
117. *PM* (June 1877), p. 204; *PM* (Sept. 1877), p. 52; *PM* (April 1881), p. 146; Kealey, "Work," p. 78; Zerker, pp. 23, 112.
118. Joseph Moxon, *Mechanick Exercises on the Whole Art of Printing* [1683–4] (New York: Dover, 1962), pp. 323–31; Wroth, pp. 158–66; Silver, *American*, pp. 8–26; Zerker, pp. 5–10.



A country newspaper office in the early 1900's, Eganville (Ont.) Leader. *(National Archives of Canada, PA-94797)*

In a city like Toronto an aggressive employer like George Brown of the Globe could cut traditional wages to suit his assessment of the market. Masters anywhere could fill their shops with apprentices. And increasingly, new technologies like stereotyping and cylinder presses threatened the livelihoods of old-style printers. The unions were begun with the express aim of preserving the status and prerogatives of the trade in the new industrial era through the regulation of wages and hours, apprenticeship, and the movement of members of the trade. This last issue, management of the 'tramping system' was very important.[119]

Journeymen printers were known for their high mobility, partly induced by the tendency of masters to hire on men during busy periods and let them go when work was slack, but also by the special and rare quality of their skill. Their knowledge being portable anywhere in the English-speaking world, printers often spent part of their lives on the "tramp" moving from town to town, taking temporary work and sharing with their fellows the knowledge gained from diverse experience. While the life of the open road has been romanticized, the reality was that many tramps were driven to it by uncertain and temporary employment. It was a reality common in mid-19th century society, a time of great social transience and chronic overpopulation in country districts. During a time like the depression of the 1870s, transient printers were the least fortunate men of their profession. Almost every issue of the *Printer's Miscellany* carried an anecdote about a tramp down on his luck. Usually he was the subject of, at best, condescension and, at worst, abuse. Characterized as drunks, laggards, and degenerates, tramps in most stories were quickly shown the door. The following is a typical example:

> *A tramp was in town the other day and wanted work, enough money for a drink, a chew of tobacco, or to beg a better coat, more particularly the latter, but failed to get anything but a chew, after which he departed in peace, and it is hoped not to return.*[120]

Local unions participated in the tramping system in a number of ways. The first was to provide travel allowances to their unemployed members wishing to leave town and tramp relief to newcomers from out of town. In both cases they hoped that by providing emergency support the printers would not be tempted to seek jobs at less than union wages. To regulate this system, unions created travelling cards. A union member wishing to leave town requested a card from his union certifying him as a member in good standing. This card would usually be honoured in other cities, entitling the printer to traveller's aid and ensuring him access to employment in union shops. It was to regulate who could grant travelling cards and to make their rights and privileges fully reciprocal that local unions in the United States and Canada joined together in the 1850s and 1860s to form the International Typographical Union. By 1880 locals of the ITU were established in most Canadian cities. In the period between 1880 and 1920 the ITU was to achieve its greatest successes. During this time unionized workers helped shape the course of technological development in North America.[121]

119. Zerker, pp. 17–37; Kealey, "Work," pp. 77–79.
120. *PM* (Sept. 1877), p. 61; see also *PM* (July 1878), pp. 21–22.
121. Zerker, pp. 53–77.

2 Production for the Mass Market: Machine and System Challenge Hand and Craft, 1880–1920

In 1914 a writer in the *Canadian Printer and Publisher* identified the pivotal position of the printing and publishing industry within Canada's evolving economy. As a secondary industry, not only was printing "dependent on the state of trade in other lines for its patronage." But at the same time, trade depended on it. For "without printed matter the transaction of business is practically impossible."[122] During the period from 1880 to 1920 employers and workers within the Candian printing industry took part in a general, dramatic transformation of the Canadian economy and society.[123]

Part 1 – Printing and Canadian Society, 1880–1920

In this period the modern territorial extent of Canada, with the exception of Newfoundland, was reached. This involved the establishment and completion of agricultural settlement on the Canadian prairies, aided by the construction of three transcontinental railways, beginning with the CPR in 1881–1885. Territorial consolidation was accompanied by great changes in the Canadian economy. Tied as it was to an international economy, especially for its resource exports, Canadian conditions followed those elsewhere in the world. Despite localized and relatively short booms, the years between the late 1870s and mid-1890s were times of economic stagnation marked by periodic crisis. From the mid-1890s until 1913 the economy boomed, though growth was unevenly distributed across the country. From 1914 to the end of the period Canada was beset again by economic crisis, though its effects were to some extent concealed by the First World War.

Exports during this period continued to come from the old staple economy. Grain production remained central, though it shifted from southern Ontario to the prairies. Between 1901 and 1911 the wheat economy accounted for 20–30 per cent of growth in Canadian per capita income. Equally important to grain was the forest industry. With the exhaustion of the eastern pine forests, lumber production shifted to British Columbia. But in the east the pulp and paper industry, exploiting stands of spruce and jackpine emerged as a powerful exporter, and one with direct relevance to the growing printing and publishing industry. A new and increasingly important area of exploitation was in mining, both of precious metals and industrial metals like nickel, needed for steel production, and copper, critical to new technologies employing electricity.

These commodities were sold on the international market, but Canada also experienced considerable growth in manufacturing destined for domestic markets. The Dominion government's economic strategy consisted of three interdependent elements: encouragement of immigration and agricultural settlement, rapid and greatly subsidized private railway construction, and high protective tariffs for Canadian manufactures. Population growth provided the markets for manufactured goods and traffic for the railways, railways promoted settlement and again created markets for such products as steel and ties, and protective tariffs ensured that these markets were captured for Canadian businessmen (not coincidentally, to their profit).

Economic growth and change occurred unevenly across Canada, amplifying existing disparities in scale and access to capital. The west experienced negligible industrialization. The Maritimes actually deindustrialized, as its local capitalists failed in competition with larger central Canadian manufacturers and banks.

122. *Canadian Printer and Publisher* (Sept. 1914), p. 34. Hereafter cited as *CPP*.
123. The historical summary that follows is based on J. M. Bumsted, *The Peoples of Canada: A Post-Confederation History* (Toronto: Oxford University Press, 1992).

Quebec, with its strong banks and emphasis on labour-intensive, consumer products manufacturing, experienced average industrial growth. Ontario saw its growth surpass the Canadian average, with strength in banking and capital-intensive heavy industries like steel and key growth sectors like farm implements.

During this period Canada's population doubled and its distribution changed radically. While in 1881 more than three quarters of Canadians lived on the land, by 1921 almost one half lived in cities and towns. In a mere twenty years after 1900, the population of Montreal nearly doubled to 618,000, while Toronto more than doubled to 521,000. Urban growth was also a western phenomenon, town and city dwellers representing 35 per cent of population on prairies by 1921. The largest western cities by this time were Winnipeg at 179,087 and Vancouver at 117,217. Both had been little more than villages in 1880. Everywhere, smaller centres also grew either at the expense of surrounding rural areas or as the beneficiaries of overseas immigration. Such rapid growth, combined with persistent social inequality (half the urban working class was estimated to live at or below the poverty line) resulted in horrendous squalor and inadequate public services in most cities. Underlying these trends was the fact that increasing numbers of Canadians were no longer independent farmers or artisans but full-time wage workers.

Social changes were also creating a new market in consumer goods and a new industry called advertising. The role of the household as a centre of production was steadily weakened as its members became implicated in the labour market. As members became increasingly dependent on cash employment, household needs like clothing and food had to be met by purchasing goods. At the same time manufacturers, pressed by competition, continually sought both to expand their markets and reduce their costs through mass production. National markets for consumer goods thus emerged. The printing and publishing industry played a key role in this process through advertising and packaging.

In classical economics advertising simply provides information about a product, explaining to the consumer its "marginal utility," what makes it preferable to another product available to the consumer. Other analysts, however, emphasize the ideological function of advertising and its emergence during a critical historical period that saw the formation of a modern or industrial capitalist society. James D. Norris, for example, views advertising as a conscious attempt to create demand for products by evoking the American dream, the "collective notion of the good life" epitomized by the upper-middle-class consumer. Rather than a distillation of collective desire, Stuart Ewen characterizes advertising as a form of social control, the creation of a consumer mentality that would bind a recalcitrant working class to the new industrial capitalist mode of production by channelling social insecurity into the acquisition of products. While advertising clearly did perform an informational role, the history of Canadian advertising also points to its function in creating markets and fostering the consumer mentality required to make them function.[124]

While advertising had existed in Canada for as long as there had been businesses, in the 1890s it took on a new role as a creator of demand. Before this time, consumer products were generally bulk commodities measured and packaged by a local retailer to meet existing demand. Manufacturers rarely advertised and retailers, being generally local, restricted their publicity to local publications. At this stage, advertising largely did conform to the classical model. One trend that broke this pattern was the rise of large department stores. Such firms as Eaton's not only advertised extensively, but they published lavishly illustrated mail order catalogues that importuned the clientele of small, local merchants on farms and in villages, towns and cities across the country. Timothy Eaton published his first catalogue in 1884.[125]

Another turning point was the establishment of the McKim Advertising Agency in 1889. Agencies like McKims allowed manufacturers to bypass local retailers, advertising in many publications with expertly produced material as part of national campaigns. For a single fee, the agency placed ads in newspapers across the country. It provided circulation information so that advertisers knew the number of potential

124. James D. Norris, *Advertising and the Transformation of American Society, 1865–1920* (New York: Greenwood, 1990), pp. xvi, 48; Stewart Ewen, *Captains of Consciousness: Advertising and the Social Roots of the Consumer Culture* (New York: McGraw-Hill, 1976), pp. 18, 23–39.

125. H. E. Stephenson & Carlton McNaught, *The Story of Advertising in Canada: A Chronicle of Fifty Years* (Toronto: Ryerson, 1940): pp. 38–46.

customers they might reach. And the agency designed and produced the ads, using commercial artists to produce work of a type and quality unobtainable from the composing staffs of individual newspapers.[126]

The new approach to marketing was characterized by "Salada" tea. Before 1890, according to the company president P. C. Larkin, most tea sold in Canada came from China and Japan and was measured out and sold in the store from large tea chests. Larkin had an interest in Ceylon teas but found the public knew little of them and retailers were content simply to supply traditional demand. His strategy was twofold. He supplied the tea to grocers in small, sealed packets and labelled them with a familiar sounding and easily pronounced brand name. Then he began to advertise in daily newspapers, to the point that by 1902 the advertisements appeared in every daily in Canada. As his volume of sales increased, the cost of his advertising per pound of tea fell to "a small fraction of a cent" and "Salada" became a "household word."[127]

An even more extreme example is the case of "Quaker" oats. Oatmeal itself is a simple product, readily produced by any local grist mill. Just after the turn of the century, the American Cereal Co. turned this humble commodity into a desired brand name through a saturation publicity campaign never before seen in Canada. Not only did it advertise in daily and weekly newspapers, but it sent "nice-looking young men" dressed in Quaker garb door to door handing out samples in "large and handsome packages." In addition, it put up colour posters throughout cities, flew kites bearing Quaker slogans, and at night projected "stereopticon views" on the sides of buildings.[128]

In light of the key role played by printing in Canada's social and economic transformation, it is not surprising that the industry experienced a time of high growth. While the population of Canada doubled between 1881 and 1921, the number of employees in printing and publishing increased by five times, despite the introduction of labour saving technology. In this same period, gross value of production had increased over 15 times and value added (value of shipments minus costs of materials, supplies and energy) by 17 times. This indicates a higher rate of growth both in output and employment than in manufacturing as a whole. The number of all manufacturing employees just kept pace with population growth, increasing by less than 2.5 times, while the gross value of production and value added in the manufacturing sector increased by just 12 times. Indicative of the effects of new technology, value added per employee in printing and publishing had quadrupled from $604 to $2409. Details of technological change will be discussed in the second part of this report.[129]

Apart from technological change and actual growth in output and employment, the most significant trends within printing and publishing were a continuing segmentation of the industry into specialized operations, and a new, consuming attention to management methods to increase profitability. One major trend was the abandonment by daily newspapers of their job departments. Job and newspaper work had initially been reasonably compatible, as long as

126. Stephenson & McNaught, pp. 10–12, 19, 93–98.
127. *CPP* (Oct. 1902), p. 16.
128. *CPP* (Nov. 1902), p. 18. One interesting feature of the Quaker campaign was the use, in an urban context, of pre-industrial, puritan symbolism. While the American Cereal Co. represented the conquest of local markets by an international producer, its publicity evoked an idealized rural and moral past. Similarly, ads for Clark's mince meat sold that product as a "blessing to the busy housekeeper" not simply because it was pre-prepared, but because it was "pure", made from "selected meats" for use in pies "like the ones mother used to make." (*CPP* [Feb. 1902], p. 16) While advertising often was for unabashedly modern products like bicycles and automobiles, frequently the appeal of publicity was that it offered a relief or release from the stresses of social change, a return to an imagined, idyllic, pre-industrial time.
129. F. H. Leacy, ed., *Historical Statistics of Canada*, Second Edition (Ottawa: DSS, 1965), series A2–14, R1–22, R337–342.

jobs could be run on newspaper presses during off-peak times. But as the technological requirements of newspaper work became more distinct from job work, most notably with the use of rotary presses, the two divisions became increasingly incompatible. The large city dailies were the first to close or sell off their job departments—by 1900 most had done so. Later the trend spread to smaller city dailies like the Guelph *Mercury*. Its publisher in 1912 argued that only specialization would save papers like his from being swamped by the big city papers. Smaller proprietors were advised to be "systematizing their equipment for the production of their paper in the fastest, and least expensive method." This necessarily involved shedding the job department. Only among the country offices were the job department and weekly paper still integral.[130]

The most obvious newspaper development in this period was the decline of the partisan press and the rise of the mass circulation daily newspaper conducted as a business enterprise by well-capitalized corporations.[131] This process began in the 1870s and was well advanced by the turn of the century. The number of dailies in Canada increased from 47 in 1873 to 112 by 1901. Circulation increases were massive. In Montreal between 1872 and 1900 the circulation of French language dailies increased from 7,760 to 104,060. Much of this was due to one paper, *La Presse*, which added 50,000 readers in the decade of the 1890s. In the 1870s there were two Canadian families for each daily and weekly edition of a daily newspaper. By 1896 the number of newspaper issues actually exceeded the number of families in Canada. The daily press had become, in the words of one historian, "Canada's first mass medium."[132]

The features of this new press were entirely different from the old. Learned essays and partisan political commentary were replaced by extensive and often sensational coverage of local events. Indeed one historian has typified the change in style as a transition from "le journal d'opinion" to "le journal d'information." Papers began to break out of their rigid column formats, seeking through increasing use of bold headlines and illustrations the attention of potential readers. These changes reflected an attempt by publishers to tap a new audience among classes of people who had not in the past subscribed to daily newspapers.[133]

Several causes have been proposed to explain the development of newspapers as a mass medium. Technology in the form of stereotyping, rotary presses and typesetting machines made possible the rapid and cheap production of greatly increased circulations. Improved communications and transportation facilities allowed the more easy gathering of information and dissemination of newspapers. The availability of relatively cheap newsprint made from sulfite wood pulp reduced a major deterrent to increasing newspaper size or circulation. On the consumption side, social change was creating an industrial, urban society with a newly literate working class audience thirsty for knowledge and diversion.[134]

But all these factors would have been insufficient without the decisive role played by advertising profits. In 1908 Medill McCormick, publisher of the Chicago *Tribune* lectured members of the Canadian Press Association on the debt their editorial departments owed to "the income of our advertising departments."

> *Advertising has built the multiple presses, it has created newspaper art, it has stretched cables from continent to continent, it has supported our intercontinental dragnets of information and news collection, it has made it possible for every town upwards of one-thousand inhabitants, to own its local sheet.*[135]

Advertising had, McCormick added, built the department store, the mail-order house and the "National Biscuit Company."

In the 1890s, approximately two thirds of newspapers' revenues came from advertising. By 1918 this share had increased to about three quarters. Increasingly, the job of the publisher who hoped to profit was to "sell his readers to the prospective advertiser." Where the partisan paper addressed its readers as citizens, the new

130. *CPP* (May 1892), p. 1; *CPP* (Feb. 1900), p. 10; *CPP* (Feb. 1912), p. 39; Rutherford, *Victorian*, p. 97; *CPP* (July 1906), p. 16.
131. For detailed studies of mass circulation daily newspapers, see Rutherford, *Victorian*; Jean de Bonville, *La presse québécoise de 1884 à 1914: Genèse d'un média de masse* (Québec: Presses de l'université Laval, 1988).
132. Rutherford, *Victorian*, pp. 4, 5, 45, 63, 69.
133. Rutherford, *Victorian*, pp. 115–155; de Bonville, p. 1.
134. Rutherford, *Victorian*, pp. 9–35; de Bonville, pp. 358–61.
135. *CPP* (Mar. 1908), p. 36.

popular paper addressed itself to readers as consumers.[136]

Profits from advertising gave publishers a powerful incentive to increase their circulations. To do so, their editorial policies became more inclusive, not only by appealing to presumed popular tastes for trivia and sensation, but by appealing to local community pride and by minimizing sectarianism that would alienate potential readers. In this context, the importance of political commentary and the editor as shaper of public opinion declined. Time and again during the 1890s, editors reading the *Canadian Printer and Publisher* were urged to abandon their "snarling, cantakerous" political jeremiads and devote their energies to thorough reporting of local news.[137] News itself became a commodity, to be sold to readers in order that readers could be sold to advertisers. By 1917, E. F. Slack of the Montreal *Gazette* could say that it was no longer very original to point out that "news is merchandise, just as potatoes, cloth, nails, and oil are merchandise."[138] In 1905 a speaker to the Quebec Press Association summed up the "revolution" in newspapers.

> *Time was ... when the newspaper was owned and directed by one or two gentlemen for the primary purpose of moulding public opinion ... The editorial mind was the controlling influence. The business office was a minor consideration ... To-day the business office dominates seven days in the week, and the editorial mind must be subservient to its necessities. ... the newspaper has become a mere commercial enterprise like any other business having as its main purpose the accumulation of wealth.*[139]

Such developments were not met with universal approval. The cheapening of printed matter and the exploitation of new markets among the working class alarmed some spokesmen for an older, ostensibly more genteel pre-industrial social order. As early as 1884 G. Mercer Adam lamented the decline of the bookselling trade from its "high estate" as an honourable profession for the "well-informed reading man." So much of the trade was now relegated "to shopgirls in mammoth bazaars, to ignorant street pedlars, and the itinerant auctioneer" hawking "'dime novels' and vile illustrated weeklies."[140] The Bishop of Algoma attacked the invidious effects on children of fairy tales, children's papers and dime novels.

> *Reading such as this stimulates a child's brain to a state of unnatural precocity—surrounds it with an atmosphere of unreality ...—teaches it to distrust and feel discontented with common prosaic scenes and duties of everyday life—encourages listless day dreaming and idle revery—keeps the nerves of the imagination perpetually on the stretch, till they have lost all their proper elasticity, and fall into a condition of actual mental disease, unfitting for any strong, concentrated effort, and leaving its victim at last an intellectual inanity—and lastly, while worst of all, it creates a violent and intense distaste for all sober, serious, religious thought, and for any reading, whether of the Bible or otherwise, which would rudely break in on its pleasant dreams, or suggest the memory of God or death, or the judgement of eternity.*[141]

For observers such as these, the success of printing in the late nineteenth century was in fact a problem—it placed the wrong works into the wrong hands.

While daily newspapers took on their specialized role and conservatives fulminated at the decadence of popular publishing, firms within the commercial printing sector were increasingly driven by the quest for profits to focus on special niches. Already in 1896 the *Canadian Printer and Publisher* wrote that

> *... the day of the all-around printer has passed; from being conducted by practical men the business is passing into the hands of specialists who will look at investments in printing from a purely financial point of view. ... offices equipped to print everything from a wedding circular to a mammoth poster are now among the things of the past.*[142]

This process was driven partly by the adoption of new technologies that required specialized equipment and workers, the most obvious example being photoengraving. As the range of available

136. Rutherford, *Victorian*, pp. 98, 99; *CPP* (June 1918), p. 22; de Bonville, pp. 363, 364.
137. *CPP* (Sept. 1892), p. 21; *CPP* (Dec. 1895), p. 3; *CPP* (Feb. 1897), p. 23; *CPP* (May 1897), p. 2; *CPP* (July 1897), p. 1.
138. *CPP* (April 1917), p. 14.
139. *CPP* (April 1905), p. 9.
140. *Books & Notions* (Aug 1884), p. 4.
141. *Books & Notions* (Jan. 1885), p. 87.
142. *CPP* (March 1897), p. 6.

processes and products increased, it became impossible for printers to maintain establishments covering the full range. At any one time, it was estimated, two thirds of this equipment stood idle, costing the proprietor money for insurance, rent and interest. At the same time, proprietors were becoming more concerned with maximizing labour productivity, and believed that efficiency could best be achieved by putting workers to repetitive, specialized tasks.

In 1918 Stuart Fleming, managing director of Richardson, Bond & Wright in Owen Sound, Ontario, identified sixteen "industries" within the printing field. Some of these, like the stationer, advertising agency and news agency did no printing operations themselves, being involved either in retailing the work of manufacturing printers or suppling materials for production. Others, like electrotypers, designers and engravers performed specialized tasks in preparing printing surfaces. Lithography and photogravure firms were distinguished by their unique technologies and, to some extent, the special character of their output. Finally, within letterpress printing and binding other specialties were emerging. In towns, general job printers still produced a wide variety of commerical work, doing both composition and presswork but no binding, which was now done largely by machine. City book and job printers turned out a variety of bound books, pamphlets, reports and catalogues. But other city printers specialized in catalogue and advertising work, "high class" stationery requiring die stamping and embossing, magazines, blank books and blank forms, law books, and, of course, newspapers. Doomed, Fleming believed, was the country printer, squeezed out of newspaper advertising by "district" papers located in towns and in other work by stationers acting as retailers for "manufacturing" printers. Fleming's own company successfully specialized in business forms and other corporate printing (see next chapter).[143]

Not mentioned by Fleming but becoming equally evident were companies specializing in typesetting or presswork "for the trade." Like the engraving companies, such firms would perform work for other firms in the industry, rather than provide a complete service to the public. In 1910, for example, Alex. Anderson advertised as "the largest establishment in Toronto devoted to TRADE PRESSWORK." The first trade typesetting house in Canada was Reid & Doidge of Toronto, established in 1902. Over the next two decades, trade typesetters opened shop in most major and many minor Canadian cities. These firms, equipped with typesetting machines, provided composition by the galley or in some cases complete make-up services to book and job printers. Some companies using the Monotype machine also did type founding. The most well-known of these firms was the Moore Type Foundry, established as Moore Telford in 1917.[144]

This diversity within the printing industry was matched by the continuing coexistence of small firms with larger operations. In the forty years between 1880 and 1920, the average number of employees per firm barely increased, from 14 to 16. As in the period before 1880, this number represented firms with anywhere from several hundred to fewer than five employees.[145]

The trend toward specialization was part of a general trend within commercial printing toward a more systematic approach to business, most notably regarding production costs and pricing. In 1893 the *Canadian Printer and Publisher* commented that "printing offices are now essentially places of business, where the men are paid to do their work. A decade or two ago [they were] the haunts of tramps and the scenes of silly jokes ... The reform did not come before it was needed."[146]

The immediate cause for this change was the economic crisis of the early and mid-1890s, when many job printers failed and others were driven to desperate price cutting. Many printing offices were run by "practical printers" who priced their jobs by rule of thumb and who, when pressured by slow business or pressing debts, slashed their prices below cost. Such pricing undermined profits for the entire trade. "It is astonishing," wrote a *Canadian Printer and Publisher* editorialist in 1894, "just what little business method is to be found in the small printing offices of Canada." Printers within the Canadian Press Association and, after the turn of the century, various local printers' boards of trade, sought to train printers in business methods, hoping that a true appreciation of production cost, including often ignored overheads like

143. *CPP* (Jan. 1918), p. 23.

144. *CPP* (Jan. 1910), p. 56; Ed T. Cooper, *Chronology of Trade Typesetting in Canada* (Toronto: Ryerson Press, 1938), passim.
145. Urquhart & Buckley, series R337–342.
146. *CPP* (Feb. 1893), p. 1.

interest on capital and depreciation of equipment, would bring discipline to competitive pricing. The Canadian Printer and Publisher rallied the job printers with the cry "Systematize! Systematize! Systematize!"[147]

This process continued unabated with the return to prosperity, marking a final break with the pre-industrial printing workshop. Some interest was shown in "scientific management." This fashionable doctrine involved a detailed observation of the movements of workers as they performed their various tasks, including the measurement of distance their feet and hands moved, and the amount of time, recorded by stop watch, they spent in each subtask. Armed with this data, the scientific manager then rearranged the shop floor for more efficient movement and redefined jobs so that complex tasks were broken down into simpler, repetitive ones that minimized superfluous movements and eliminated time wasted in unproductive effort. In the years before World War I many Canadian printers erected new buildings laid out for efficient operation. The Canadian Printer and Publisher carried regular reports on these structures, publishing floor plans as guidance for other printers. In 1911 in a series of articles titled "Economy in Mechanical Arrangement," a CPP reporter stated, "it is usual to so arrange a manufacturing establishment (and printers are manufacturers) that work goes through each step in the process in natural sequence, thus eliminating all unnecessary labor." Equipment suppliers abetted this trend. American Type Founders established an "Efficiency Department" that advised printers on floor plans and designed cases, cabinets and other equipment for its "Cut-Cost System" for composing rooms.[148]

Part 2 – Printing Technology, 1880–1920

In its very conception, printing was designed for the rapid reproduction of text and images. This had always had an economical as well as physical aspect. Speed or quantity of output, say on a daily newspaper, could be increased by multiplying the number of workers or the number of hours they worked. But at some point the rate of increase in labour costs exceeded any rise in profits from additional sales, even if customers paid a premium for timely information. In the period between 1880 and 1920, this economic context became increasingly clear. The pace of technological change was ultimately set by proprietors' concerns for profit in a highly competitive market. The result, though not necessarily the intent, was that wherever possible owners replaced the slow and unpredictable action of human hands with the rapid, predetermined and monotonous repetition of actions by machine. In presswork, output was increasingly determined by the speed of machines. Eventually, human feeders became a bottleneck in the printing process and lost their jobs to machines. In typesetting, the arrangement and justification, casting, and distribution of types was rendered largely mechanical. And in image reproduction, photomechanical processes reduced subjective human input in favour of systems that more closely approximated the original.

These changes effected a huge increase in labour productivity as the amount of time required to produce a book fell from months to days, and newspapers expanded from four page sheets produced by several hours of hand labour to multi-page editions printed in minutes. In 1852 the number of "man hours" required to produce 10,000 64-page magazines was 3,170. By 1896 this number had plummeted to 15. A pamphlet with a cover in two colours took 84 man hours in 1888. Just seven years later, the same job required 4 man hours. As a result of this change, the cost of printed matter fell, stimulating demand for more.[149]

For Canadian printers, the sources of this technology, and usually the machines themselves, were overwhelmingly foreign. Canadian firms built typesetting machines and some small presses and bindery equipment according to American designs. And until it went into liquidation in 1897, the Dominion Type Foundry of

147. Quotes from *CPP* (Aug. 1894), p. 1; *CPP* (Oct. 1893), p. 4; *CPP* (July 1894), p. 4; *CPP* (Oct. 1909), p. 11. Many also hoped that this process might lead to the establishment of uniform price lists, thus eliminating price competition altogether.

148. *CPP* (Feb. 1991), p. 40; *CPP* (June 1911), p. 52; *CPP* (Jan. 1912), p. 39; *CPP* (March 1913), p. 33; *CPP* (June 1913), p. 43; American Type Founders, *Specimen Book and Catalogue* (1923), pp. 1011–1066. Quote in *CPP* (Jan. 1911), p. 29.

149. Elizabeth Baker, *Printers and Technology: A History of the International Printing Pressmen's and Assistants' Union* (New York: Columbia University Press, 1957), pp. 22–23.

Montreal lived a precarious existence as Canada's only maker of types. But the majority of presses and types originated elsewhere, most notably in the United States. In 1880, for example, Canadian printers imported 156 American presses and 8 from Britain. Twenty years later the number of American presses had increased to 383, and the number of British machines to just 20. This trend continued in the next two decades, so that by 1920 the value of British press imports stood at $562, dwarfed by American imports of almost $1 million. In types, British producers enjoyed an initial advantage, in 1880 selling almost twice as much in Canada as the Americans. But by 1890 the value of British and American imports was about equal. By 1900 U.S. type founders were selling more than twice the product of their British competitors, an advantage that they widened in the next two decades. From about 1910 onwards, American makers also monopolized the Canadian business in typesetting machines.[150]

Press Developments

In 1896 a writer in the official organ of the International Typographical Union surveyed technical developments in the printing trade and concluded, "the press, as it now is, pulsing, vibrating, throbbing, delicate, nervous, stronger than a dozen Samsons, is ... the real wonder of the century in our business."[151] Significant changes did take place in Canadian pressrooms in the period between 1880 and 1920. The most important was the widespread adoption by large daily newspapers of the web-fed rotary perfecting press. While the use of jobbing platen and cylinder presses continued from the earlier period, these machines were greatly improved.

Between 1890 and 1910, electricity largely replaced steam as the source of motive power in printing plants. The first regular use of electricity to run a printing press occurred in Lawrence, Mass. in 1884, just one year after motors were first installed in any factory. The printing industry as a whole, in fact, surpassed other manufacturers in their rapid adoption of electricity. While initially presses were driven indirectly from belts and shafts, in the twentieth century presses were increasingly equipped with individual motors.[152]

Canadian printers were quick to see the advantages of replacing their volatile steam boilers and cumbersome belt and shaft systems. Electricity was clean, generated no heat, consumed less space, and provided continuous and steady power. In 1893 the *Canadian Printer and Publisher* reported that city job printers used nothing but electricity. By 1894 motors had been "largely adopted" in Toronto printing offices. Daily newspapers appear to have been slower to convert from steam, perhaps due to greater power requirements and the need for a reliable power source. In 1895 the leading Montreal dailies still used steam. By 1907, however, leading dailies were running on electricity. Reliable supply remained a concern, at least with some papers. In 1914 when it moved into its new building the Manitoba *Free Press* installed a reserve steam generator to protect against power interruptions.[153]

The most significant development in jobbing platens was the replacement of the human feeder by automatic devices. One description of the operator's job gives an impression of life before automatic power presses were introduced:

> *He stood balanced on one foot, the other pumping the treadle in rhythm with the main crankshaft. Simultaneously, with his right hand he picked up a sheet of paper from the pile on the feedboard and moved it to the left and down and forward on the platen, positioning it exactly against three guide (gauge) pins in one continuing motion. Instantly after positioning the sheet he pulled back his hand else it be crushed between the closing bed and platen. While his right hand moved again to the pile of sheets, the print*

150. Canada, Parliament, *Sessional Papers* (1881), No.2; *Sessional Papers* (1891), No.4; *Sessional Papers* (1901), No. 11; *Sessional Papers* (1911), No. 11; *Sessional Papers* (1921), No. 11. For information on the Dominion Type Foundry, see *CPP* (Feb. 1894), p. 20; *CPP* (July 1896), p. 9; *CPP* (Feb. 1897), p. 22; *CPP* (March 1899), p. 11; *CPP* (Jan. 1901), p. 8. Assets of DTF were subsequently acquired by the Toronto Type Foundry. This firm, like its failed predecessor, acted as agent for the giant type combine, American Type Founders (ATF). In 1897 it advertised that all its types were made by ATF. It is unclear to what extent, if at all, the Toronto company later cast types, either of its own design or from imported ATF matrices: *CPP* (July 1897), p. 9.

151. *Typographical Journal* (16 Nov 1896), p. 381.

152. For a more detailed study of electrification in the printing industry see Warren D. Devine, Jr. "The Printing Industry as a Leader in Electrification, 1883–1930," *Printing History* 7,2 (1985), pp. 27–36.

153. *CPP* (Sept. 1893), pp. 1–2; *CPP* (March 1894), p. 16; *CPP* (June 1895), p. 11; *CPP* (May 1907), p. 5; *CPP* (Feb. 1914), p. 39.

was made and his left hand started its move forward to grasp the sheet from the opening platen and deliver it onto the printed pile at his front. In this brief moment, his right hand was feeding another sheet, and all the while one foot was rising and falling with a steady rhythm. A good pressman could repeat the cycle a thousand times an hour without spoiling a sheet and hold the pace with only minor stops for a 10- or 12-hour day.[154]

The first mechanization of this process involved feeding the press from a paper web and automatically cutting sheets before delivery. The Kidder press, introduced in 1879, was called by the *Printer's Miscellany* "a revolution in job presses" that was said to nearly double the speed of ordinary machines. By the turn of the century, Canadian printers could also buy a web feeding apparatus that attached to an ordinary platen press. In 1908, the Bawden Machine & Tool Co. of Toronto produced a roll-fed platen press patterned on the Meisel machine introduced in the United States three years earlier. Perhaps the ultimate machine of this type was the New Era press for tickets and cards. Introduced around the turn of the century, it consisted of several platen machines hitched in tandem. It could print several colours at a time and perform other functions like perforating and scoring at a speed of 9000 impressions per hour. Versions of the New Era press were being produced until at least 1950.[155]

Automatic sheet feeders for platen job presses were slower to be introduced. In 1904 a British manufacturer introduced the Falcon, which increased the operator's feeding speed by providing an automatic takeoff. In 1913 the Miller Saw-Trimmer Co. began selling the first sheet-feeding device, for attachment to Chandler & Price platens. This product used suction to separate and feed sheets and grippers to remove and deliver the printed sheets. During World War I labour shortages made Canadian printers very receptive to automatic feeders. "War-time efficiency," said a 1918 ad for Miller feeders, "demands the substitution of automatic feeding for the slow, expensive and unreliable hand feeding. Miller Feeders save time, money, MEN – and the Government needs MEN." By 1919, 82 printers across Canada were using the Miller devices. Other manufacturers soon followed Miller. Before 1920 several fully automatic job presses were also available to Canadian printers.[156]

The most notable changes among cylinder machines were the spread of sophisticated two-revolution presses in commercial offices and flatbed perfecting presses for small daily newspapers. After 1900, automatic sheet feeders were introduced. Throughout this period, a wide variety of machines were produced in various sizes, speeds, and configurations by numerous manufacturers. All, however, were based on techniques developed in the first decades of the nineteenth century.

Drum cylinder presses, simply constructed machines that employed a large, continuously revolving cylinder, were especially popular with country printers before the turn of the century. They were often called, for this reason, "country" presses. For years among the cheapest cylinders available, they could be used for newspaper or job work. Some could be cranked by hand or run on power.[157]

Some low-cost, stop-cylinder machines were also used in smaller offices, being similar in speed and price to drum cylinder presses. But the more expensive stop-cylinder models were intended for fine book and job work. The impression cylinder on stop-cylinder machines was small in diameter and stopped after each impression, allowing for better register than drum cylinder presses. But the intermittent action of stop-cylinder machines limited their speed, and between 1880 and 1900 they were gradually superseded by two-revolution presses. Unlike most other presses used in Canada, most stop-

154. *American Pressman* (Nov. 1965), p. 10.
155. *PM* (March 1879), p. 267; *PM* (Sept. 1879), pp. 37–40; *CPP* (Dec. 1902), back cover; *CPP* (Nov. 1908), p. 41; *CPP* (July 1904), p. 1; *American Pressman* (Nov. 1965), pp. 18–19; Moran, *Printing*, pp. 154–55.
156. *CPP* (Oct. 1903), p. 17; *CPP* (Sept. 1919), p. 3; *CPP* (Nov. 1919), p. 45; *American Pressman* (Nov. 1965), pp. 14–16; Moran, *Printing*, p. 154. Quote from *CPP* (Oct. 1918), p. 3.
157. *American Pressman* (Nov. 1965), pp. 20–21; *CPP* (March 1899), p. 13; *CPP* (Jan. 1910), p. 4. In 1881, one of R. Hoe's cheapest drum cylinders cost $2000, while a similar sized two-revolution press cost $4250. Fifteen years later, in an ad for Palmer's Printing Machinery Depot, the average price for used drum cylinders was $775, while for two-revolution presses it was $1600; R. Hoe & Co. *Catalogue of Printing Presses and Printers' Materials* [1881] (New York: Garland, 1980), pp. 5, 15. See *CPP* (Sept. 1896), back cover.

cylinder machines were imported from England, where they were known as Wharfedales.[158]

Around the turn of the century several manufacturers introduced compact, hand-cranked cylinder presses for country printers. Most appear to have been based on the travelling cylinder principle, where a small-diameter cylinder was rolled over the inked form to make the impression. One of these, the Canadian Leverless Monona was for a time made in Toronto by Westman & Baker. Also adaptable for steam, it was based on an American machine of the same name made by W. G. Walker & Co. That machine was apparently derived from the New Series Prouty combination book, news and job press of 1886. Canadian Leverless Mononas were shipped to such small centres as Warkworth, Vankleek Hill, Hagersville, and Wingham, Ontario, Moosomin, Sask. and Emerson, Man.[159]

The increasing use of illustrations in commercial printing from the 1880s onwards led to the need for a faster cylinder press able to print finely registered line and half tone cuts in one or several colours. This demand was met by two-revolution presses, which made one impression for every two revolutions of its small cylinder. Although R. Hoe & Co. claimed in its 1881 catalogue that its two-revolution machine was already "a great favorite with the trade," the first popular two-revolution press is said to have been introduced by Robert Miehle of Chicago in 1887. This machine was truly a technical triumph, and in 1904 the Miehle company bragged that it had sold more two-revolution presses than all other makers combined. By 1910 the company listed 270 Miehles operating in Canada. In 1919 it still claimed twice as many sales as all its competitors, having produced 11,000 over the previous thirty years. Other makers popular with Canadian printers were Babcock (the Optimus) and Cottrell. Two-revolution machines were built in various sizes and configurations to accommodate a range of speed and quality requirements from fine book and catalogue work to posters and newspapers.[160]

Just as with job platens, commercial printers also sought to eliminate hand feeding from new their cylinder machines. Not only did the employer have to pay a feeder's wages, but the press could only operate as fast as the human feeder. Moreover, uniform register was difficult because the feeder would place the sheet differently each time.[161] As early as 1857 American press builder George W. Taylor invented a device that employed suction to lift sheets off the pile. But commercial development did not occur until the turn of the century. In 1897 Talbot C. Dexter developed a feeder that established his firm as the industry leader. Dexter's product soon met competition from a device invented by Frank L. Cross in 1905. Dexter later purchased the Cross company but continued to sell the Cross feeder. These and other feeders increased press output from 20 to 50 per cent. In 1918, the Toronto Type Foundry was planning to convert its factory from munitions production to the building of the Camco Continuous Sheet Feeder, a British product. With the rapid perfection and acceptance of automatic feeders, the development of a fully automatic cylinder press was now possible. Although American Type Founders Co. introduced the Kelly in 1914 and sold 1800 by 1920, most fully automatic cylinder presses were not introduced until after 1920.[162]

While the two-revolution presses saw their greatest impact in the commercial field, another new cylinder press was designed specifically for the newspaper sector. The decade of the 1890s saw the emergence of demand for a fast press for daily newspapers not large enough to invest in a rotary press and stereotyping plant. This demand was first met by the Duplex, invented by

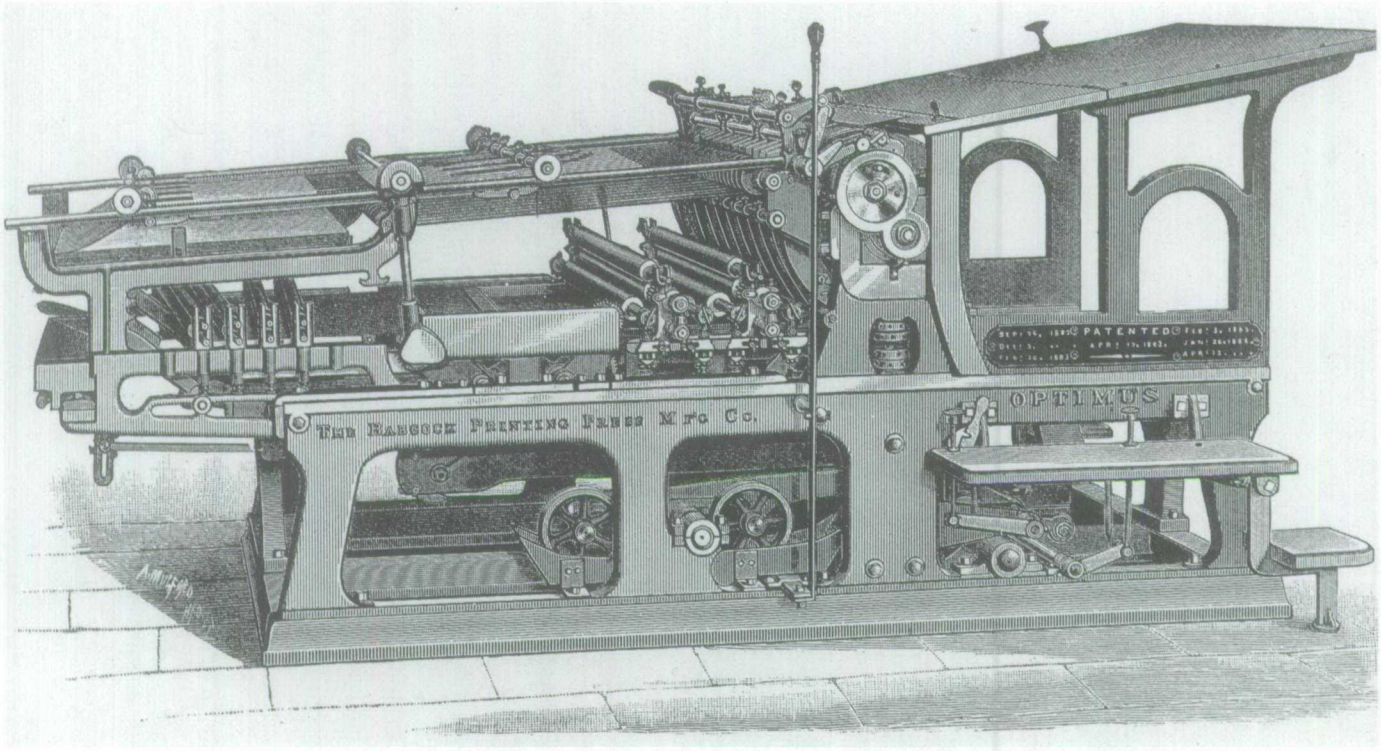
158. *Gwatkin's Traveller* (April 1880), p. 2; Hoe, *Catalogue* [1881], pp. 7, 8, 17; Neipp, pp. 260–64. Compare the prices for used drum cylinder and Wharfedale machines in the Toronto Type Foundry ad, *CPP* (Dec. 1899), p. 25.

159. *CPP* (Dec. 1896), p. 3; *CPP* (Feb. 1908), p. 15; *CPP* (Sept. 1911), p. 4; *CPP* (Feb. 1896), p. 29; *CPP* (Oct. 1899), pp. 11, 19; *CPP* (Jan. 1900), p. 3; *CPP* (March 1900), p. 11; *CPP* (June 1900), p. 11; *American Pressman* (Nov. 1965), p. 21.

160. *American Pressman* (Nov. 1965), p. 24; Hoe, *Catalogue* [1881], p. 5; *CPP* (July 1897), p. 13; *CPP* (July 1900), p. 18; *CPP* (April 1910), p. 49; *CPP* (April 1919), p. 31; *CPP* (Aug. 1919), p. 27; Neipp, pp. 264–76, 289–97, 360–63. Deeply in debt, Miehle lost ownership of his company to two Chicago brothers originally from Grimsby, Ont., John and C. T. Hewitt — see *CPP* (March 1898), p. 39.

161. For a description of the two most common methods of sheet feeding by hand, see *American Pressman* (Nov. 1965), p. 28.

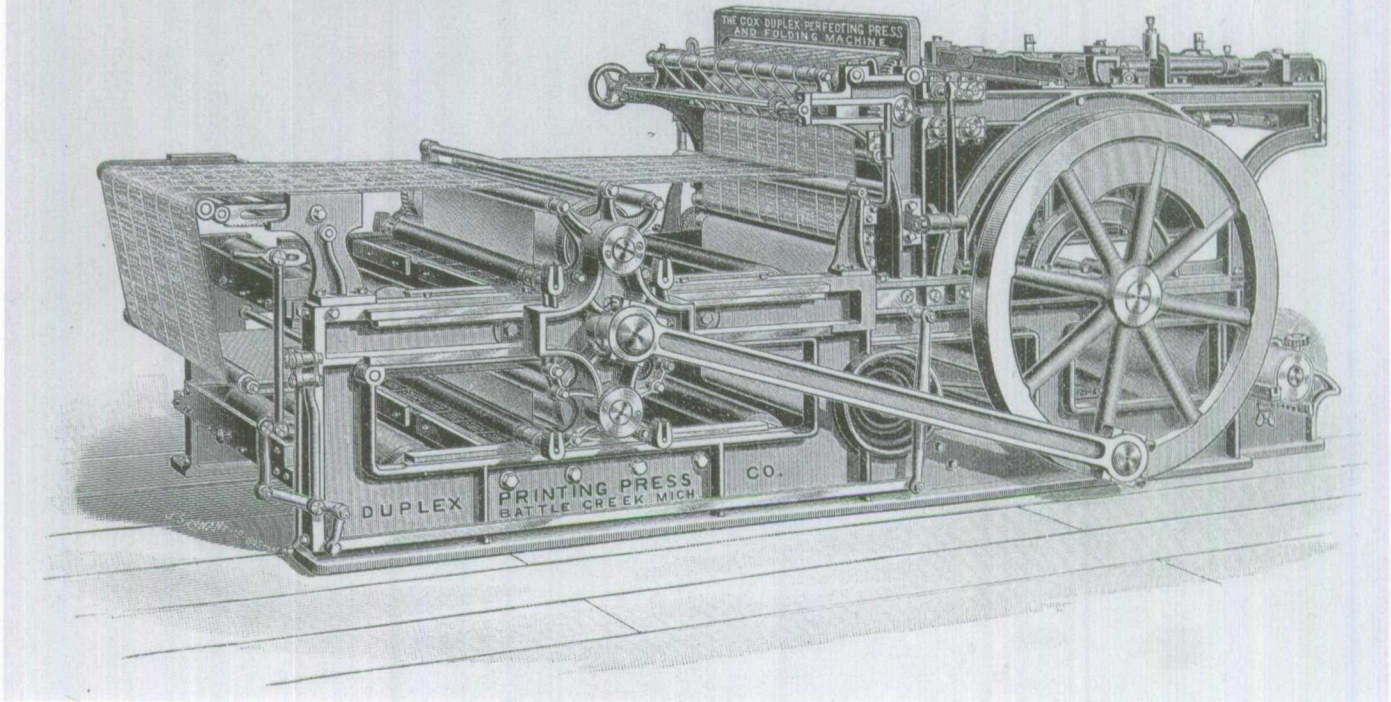
162. *American Pressman* (Nov. 1965), pp. 28–30; Moran, *Printing*, pp. 170–71; *CPP* (Aug. 1914), p. 15; *CPP* (Nov. 1915), p. 7; *CPP* (Feb. 1918), p. 3; *CPP* (May 1918), pp. 19–20.



*Two-revolution cylinder press. (*Babcock Printing Press Manufacturing Co. *ca 1892)*

THE COX DUPLEX PERFECTING PRESS AND FOLDING MACHINE.

Delivers 3,500 to 4,500 perfect papers, folded, per hour, either FOUR, SIX or EIGHT pages, from flat beds and ordinary type forms.



Cox Duplex perfecting press, invented 1889, popular with small daily newspapers. (Inland Printer)

Paul Cox in 1889. The Duplex was a flat-bed press that printed from ordinary type forms. But unlike other cylinder machines, it was fed from a paper roll and it printed both sides of the page at once. It was based on the travelling cylinder principle, the forms being stationary and the cylinder and ink rollers passing over the forms to make the impression. Because it used cheaper rolled paper and required no stereotyping, the Duplex combined high speed (up to 6000 folded 12-page papers per hour) and moderate operating cost. It was suited to small-city daily newspapers with circulations up to about 20,000. Among the Canadian dailies installing Duplexes in late 1890s were the Manitoba *Free Press*, Woodstock *Sentinel-Review*, Kingston *Whig*, Quebec *Telegraph*, and Halifax *Herald*. Early in the twentieth century, the Goss Printing Press Co. introduced its own series of flat-bed web perfecting presses, the Semi-Rotary (1909), the Comet (1910), and the Cox-O-Type (1928). Walter Scott & Co. introduced its own model as early as 1891. And in 1911 a Swiss-made version of the Duplex was offered for sale to Canadian printers.[163]

Rotary Press

Rotary motion is the most mechanically efficient means of applying ink to paper because, unlike the platen or cylinder press, it requires no reversal of direction in either form or platen with the attendant jarring, wasted energy and need for springs and brakes to reverse momentum. The principle of modern rotary presses, feeding a continuous printing medium between a revolving impression cylinder and an inked plate cylinder, dates to the late 18th century, when inventors successfully applied it to intaglio printing of patterns on textiles. But its use in printing on paper was first exploited in the letterpress field. Here, no significant progress was made until the 1840s, when the problem of fixing types on the cylinder was overcome. Not until the 1860s did final principles of rotary presses, feeding from paper web and printing from curved stereotype plates, become realized in successful machines.

The first successful rotary presses were built by R. Hoe & Co. in the United States for the Philadelphia *Ledger* in 1846 and Augustus Applegath in England for the London *Times* in 1848. Both systems placed specially secured type forms onto a large revolving cylinder. Smaller impression cylinders arranged radially around the main cylinder pressed hand-fed sheets against the forms for printing. In both presses, output could be increased by multiplying the number of feeders and impression cylinders. The Hoe Lightning press initially featured four impression cylinders and required four human feeders, producing 2000 one-sided sheets per feeder per hour. Hoe eventually produced a massive 10-feeder press able to print 20,000 sheets per hour. Hoe presses were used by many major newspapers through the 1870s.[164]

These "type revolving" machines saw some use on Canada's large daily newspapers before 1880. In fall 1868, the Toronto *Globe* installed a Hoe four-cylinder Lightning press. In 1877 the Montreal *Witness* installed an eight-cylinder Hoe press, replacing a slower four cylinder press. In 1875, the Montreal *Star* began printing on the Prestonian, an English-made type revolving press that printed both sides of the page from a paper web at a rate of 8500 complete, eight-page papers per hour. In this sense, it was a precursor of the faster machines that entered Canada in the 1880s.[165]

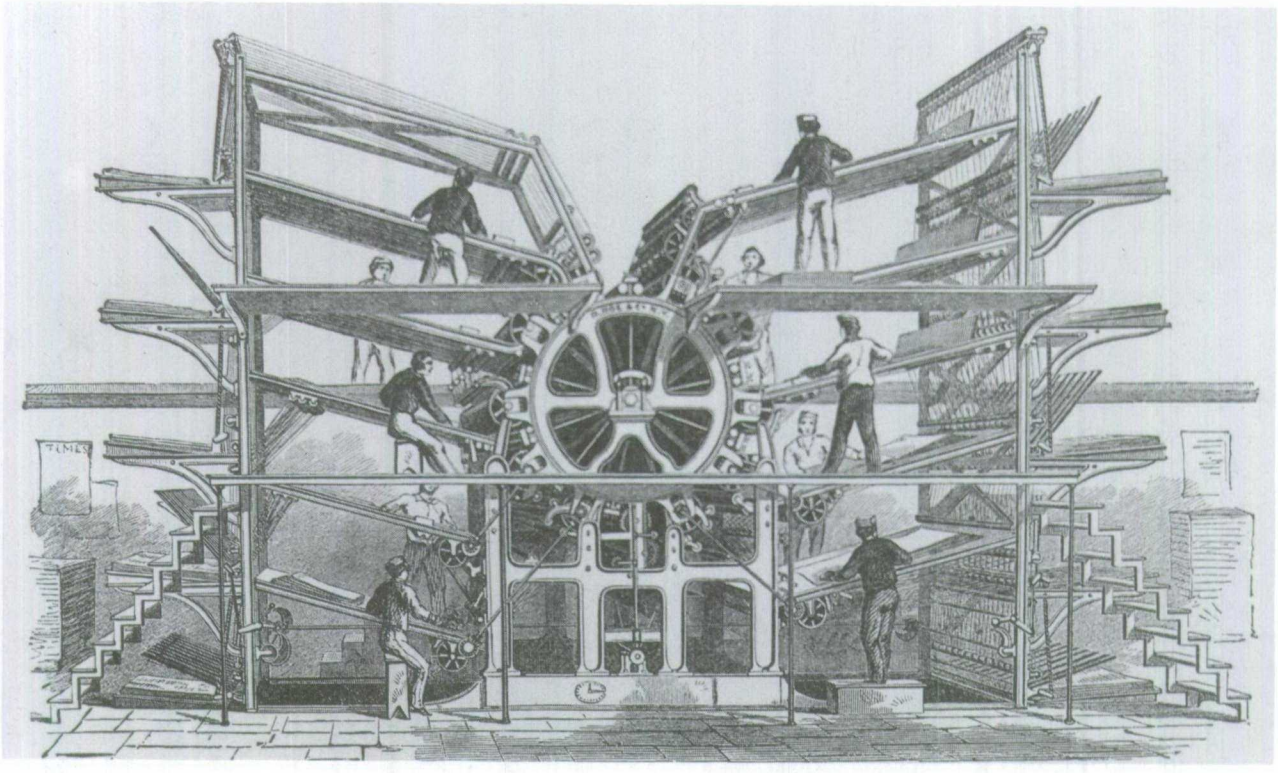
Indeed, in 1876 the *Printer's Miscellany* wrote that "the days of fast printing seem to have only begun." The Philadelphia Exhibition of that year featured demonstrations from the major newspaper press manufacturers of their new "web-printing" or "perfecting" presses. In one competition, *PM* reported, Bullock, Campbell, Hoe and Walter presses competed head to head, achieving production ranging from 7,500 to 10,500 8-page papers per hour. While impressed that such presses had "annihilated time in the production of newspapers," *PM* believed the price of the new machines, $4000 to $6000, was out of reach of Canadian printers. This did not, however, prove correct.[166]

163. *American Pressman* (Nov. 1965), pp. 42–43; Moran, *Printing*, pp. 205–7; George A. Isaacs, *The Story of the Newspaper Printing Press* (London: Co-operative Printing Society, 1931), pp. 180–82; *CPP* (March 1898), p. 39; *CPP* (Feb. 1899), p. 34; *CPP* (April 1899), p. 7; *CPP* (May 1899), p. 6; *CPP* (June 1899), p. 8; *CPP* (Dec. 1911), p. 9.

164. Neipp, pp. 73–83, 227–31; Moran, *Printing*, pp. 185–90; *American Pressman* (Nov. 1965), p. 38; Comparato, p. 268.

165. Comparato, p. 335; Rutherford, *Victorian*, p. 52, 91; *PM* (May 1877), p. 183; Moran, *Printing*, p. 193.

166. *PM* (Aug. 1876), p. –; *PM* (Jan. 1877), p. 90.



Hoe Ten Cylinder Type-Revolving Machine, an early rotary press.
(Ringwalt, American Encyclopaedia of Printing*)*

The presses that so excited the *Printer's Miscellany* marked a new era in press development that had begun in 1865 when the American inventor William Bullock built for the Philadelphia *Inquirer* the first web-fed rotary press that printed from curved stereotype plates. This machine was followed in 1869 by three machines, dubbed the Walter, built for the London *Times* by its own personnel. In the 1870s, Marinoni in Paris, Hoe in the United States and England, and Campbell in the United States also introduced newspaper presses on the new principle. These developments were made possible by other technical advances, in techniques for reliably casting curved stereotype plates, in the provision of cheap paper in rolls of uniform dimension and strength, and in the formulation of fast-drying, non-set-off inks.[167]

The large Canadian dailies were quick to take advantage of the competing presses coming on the market. The first was the Toronto *Globe*, which installed a Bullock in April 1880 able to print, cut and fold 28,000 8-page papers in one hour. Later that same summer the *Printer's Miscellany* reported that all three Toronto dailies, the *Globe*, the *Mail*, and the *Telegram*, were operating Scott rotary web perfecting presses. The *Mail*, which had two Scott presses by the end of the year, brought in an experienced stereotyper from United States to oversee the still-new platemaking process. In 1886 the Montreal *Star* also purchased two Scott perfecting presses.[168]

By the mid-1880s five manufacturers dominated the North American market for rotary newspaper presses, Hoe, Campbell, Scott, Duplex and Goss. From this period onwards, technical development focused on increasing the output of the machines. The first stage in this process was already complete. It had focussed on increasing the efficiency of the press's components, most notably the folders. Bullock's machine had employed a "chopper" folder, a rapidly moving blade that struck the sheet, forcing it between folding rollers. But the slow speed of this device limited press output to 8000 per hour. Stephen D. Tucker, working for Hoe, replaced the chopper with a revolving drum set with a blade on its surface parallel to its axis. Paper passed over the drum and was forced by the blade between rollers.[169]

The other method of increasing press output was to multiply the number of plates per cylinder and the number of printing units and webs per machine. In 1876 Anthony and Taylor of England patented turning bars, highly polished steel bars which allowed the web to be turned at angles to bring it into line with another web for cutting and folding as a single, integrated paper. In 1881 Luther C. Crowell, working for Hoe, devised the triangular former, or cow catcher. This attachment not only speeded up folding, it could fold a double-width web in half, allowing a cylinder two plates wide. Several presses in the 1880s exploited the use of either wide cylinders or more than one web. The most important were the Hoe Double Supplement (1882), the first to combine two printing units in one machine, the Goss Monitor (1885), which employed cylinders three plates wide, and the Hoe Quadruple (1887). Production of an 8-page newspaper on these machines ranged from 9000 per hour on the Goss to 24,000 on the Double Supplement and 48,000 on the Quadruple. Although in later years some manufacturers produced machines with plate cylinders five plates wide, two plate and four plate presses became the standards.[170]

The early rotary presses were designed as discrete machines of fixed size and configuration. Gradually, though, the basic "unit" of newspaper press design became the pair of printing "couples" (impression and plate cylinder) needed to print both sides of the web. These units could be multiplied according to the printer's needs. A decisive development in this direction was the introduction in 1889 of the Goss Straightline press, which dispensed with the need to turn the web to combine it with others. Following this lead, most builders began to arrange printing couples in straight lines, both in horizontal series and in tiers or "decks." From this time, rotary presses grew by steady increments both horizontally—up to eight units long—and vertically—first two decks, then three, four, and

167. Neipp, pp. 83–88, 150–57, 231–40; Moran, *Printing*, pp. 190–201; Comparato, pp. 333, 471, Isaacs, pp. 38–46.
168. *PM* (Sept. 1879), p. 40; *PM* (Oct. 1879), p. 57; *PM* (Aug. 1880), pp. 18, 22, 24–25; *PM* (Dec. 1880), p. 91; Comparato, p. 337; Rutherford, *Victorian*, p. 52.
169. *American Pressman* (Nov. 1965), pp. 38–39; Neipp, pp. 236–37; Isaacs, pp. 47–52; Comparato, pp. 388–96, 517, 607.
170. *American Pressman* (Nov. 1965), p. 39; Neipp, pp. 240–49; Moran, *Printing*, p. 213; Isaacs, pp. 53–54; Comparato, p. 608.

finally six. In 1910 Goss claimed that its "six-deck duodecuple Straightline press" was the largest in the world. At one time or another most manufacturers made similar claims for their monster machines.[171]

In the 1890s, Canadian daily newspapers met expanding circulations by investing heavily in the new rotaries. In 1892 alone the Ottawa *Free Press* installed a "fast Goss perfecting press," the Hamilton *Times* for the first time began printing on a "web press" and the Montreal *Star* replaced two smaller presses with a "mammoth" able to print 48,000 copies per hour. The turn-over in rotaries was so rapid that a second-hand market developed. *Canadian Printer and Publisher* felt compelled to warn small daily publishers not to be tempted by a used rotary if their circulations were too small to invest in a stereotyping plant. Some smaller dailies like the Manitoba *Free Press* invested instead in flat-bed perfecting presses. But the *Free Press*'s own circulation was soon so great that it turned to rotaries. In 1901 it installed a "Hoe pony quod" [sic] and in 1904 a Hoe combination colour and newspaper press able to print 24,000 16-page papers per hour. By 1914 the Free Press was said to have the largest pressroom in Canada, equipped with two Hoe colour Sextuples and one Hoe colour Octuple that together produced 132,000 16-page papers per hour.[172]

The rotary principle was also applied to printing magazines, catalogues, and labels. Ink dryers were installed to allow multiple impressions with several colours. A great variety of forms and sizes were introduced. Magazine printing tended to use a common impression cylinder with plate cylinders arranged around it in "satellite" formation. Each plate carried a separate colour. Little is known about the use of these presses in Canada.[173]

Typesetting Machine

While the new power presses greatly increased productivity in the pressroom, composition remained an unprofitable but necessary burden on the employing printer. The composing room was, according to Theodore DeVinne, "the great sinkhole" where "the profits of the house are lost." Through most of the 19th century, many inventors in North America and Europe attempted to develop a typesetting machine that would eliminate the labourious and expensive process of setting, justifying and distributing types by hand. Some 200 inventions emerged from this period of innovation. All were necessarily complicated and precise to replace the work of the skilled compositor, whose hand was said to move 13 miles in the process of setting and distributing a column of type. It is notable that Ottmar Mergenthaler, inventor of the most successful mechanical typesetter of all time, had apprenticed in the high-precision mechanics of watchmaking.[174]

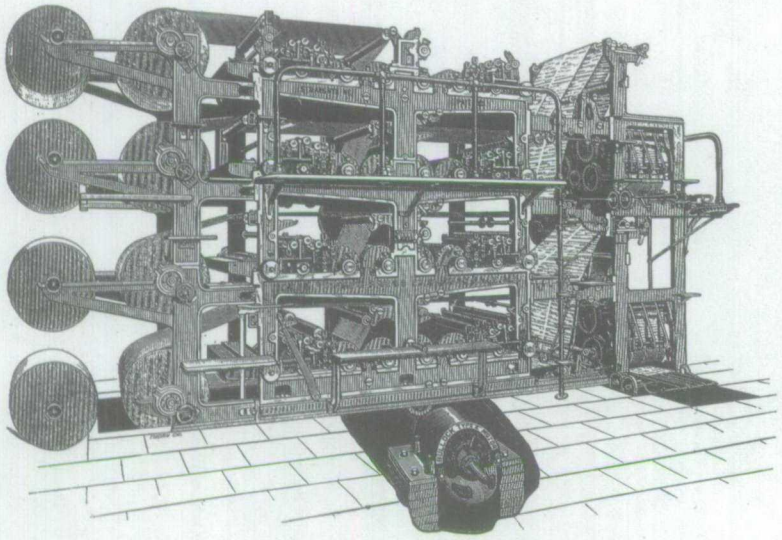
In the pursuit of their goal, inventors pursued two successful avenues: machines that set foundry type and machines that assembled matrices from which types or lines were cast.[175] Most employed the principles established by the first inventor, William Church in 1822: triggered by a keyboard, types or matrices dropped from an overhead magazine and slid along channels or guides to an assembly area. Various means of justification, using either physically adjustable spacers or arithmetic counters were employed. The most complicated aspect was automatic distribution. The successful inventors followed the principle of keys and locks, cutting nicks or teeth in the types or matrices to ensure they be delivered by the distribution mechanism into the correct slots. Some inventors hoped to avoid the need for distribution by melting down and casting new type for each job, an alternative that in

171. *American Pressman* (Nov. 1965), pp. 39, 42; Comparato, p. 614; Neipp, pp. 249–50, 392–94.
172. *CPP* (June 1892), p. 10; *CPP* (July 1892), p. 10; *CPP* (Oct. 1892), p. 12; *CPP* (Nov. 1892), p. 8; *CPP* (May 1896), p. 3; *CPP* (Sept. 1904), p. 14; *CPP* (Feb. 1914), p. 40.
173. *American Pressman* (Nov. 1965), pp. 53–55.
174. DeVinne quote in Baker, p. 69.
175. The main sources used in the survey that follows are: Richard E. Huss, *The Development of Printers' Mechanical Typesetting Machines, 1822–1925* (Charlottesville: University Press of Virginia, 1973); James Moran, *The Composition of Reading Matter: A History from Case to Computer* (London: Wace, 1965); John S. Thompson, *History of Composing Machines* [1904] (New York: Arno, 1972). See also: Lucien Alphonse Legros & John Cameron Grant, *Typographical Printing-Surfaces: The Technology and Mechanism of their Production* [1916] (New York: Garland, 1980); L. W. Wallis, *A Concise Chronology of Typesetting Developments, 1886–1986* (London: Wynkyn de Worde Society, 1988). Additional information on the Monotype may be found in Maurice Annenberg, *A Typographical Journey through the Inland Printer, 1883–1900* (Baltimore: Maran Press, 1977), pp. 539, 600.

THIS IS A CUT OF THE.....

Goss Patented 4-Deck Straightline Newspaper Press

which will be exhibited at the coming Paris Exposition in the United States Building of Liberal Arts and Chemical Industries, at Paris, France, from April 14 to November 5, 1900.



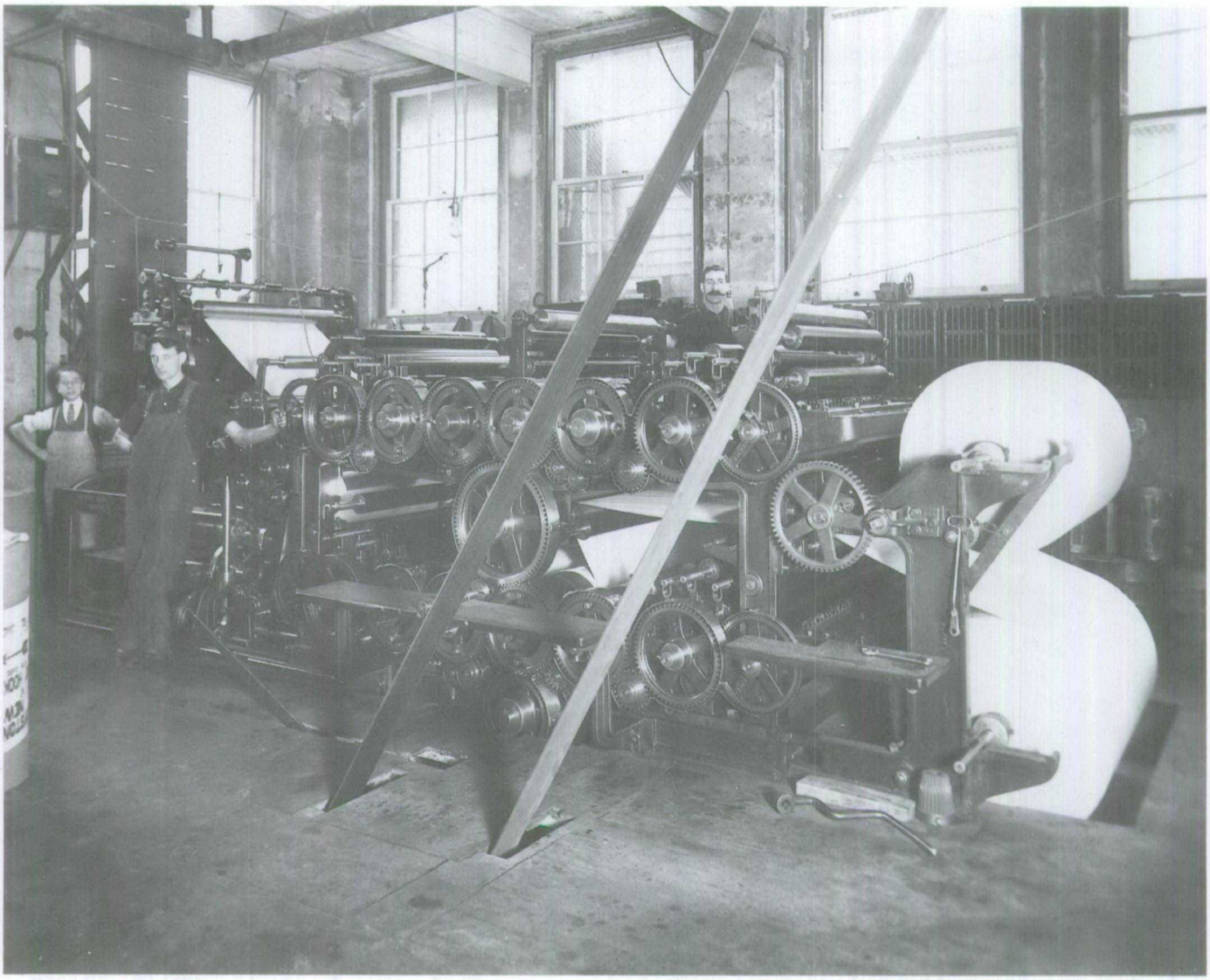
It will be in daily operation between 10 a. m. and 5 p. m., turning out papers at the rate of 50,000 per hour. It is the most practical, modern and up-to-date Press manufactured. When taking in the Exposition, don't fail to see this wonderful machine in operation.

WILL BE RUN BY DIRECT-CONNECTED MOTOR.

PATENTED AND MANUFACTURED BY

THE GOSS PRINTING PRESS CO.

Goss Four-Deck Straightline Rotary Press, 1900. (Inland Printer)



Goss Two-Deck Straightline Rotary Press, Ottawa Free Press, *1908. (National Archives of Canada, PA-42524)*

light of later developments was not as profligate and absurd as it sounds.

The first successful machines set single foundry types. The Hattersley (1857), Fraser (1862), Kastenbein (1869) and Burr (1875) enjoyed some success, the latter living on until the 20th century as the Empire machine. Most successful in Canada and the United States was the machine invented by Joseph Thorne in 1880. Under the Thorne nameplate and later in its improved form known as the Simplex or Unitype, this machine became popular with country newspapers. While justification was by hand, distribution was automatic.

In each of these machines a considerable part of the mechanism was devoted to the storage and distribution of thousands of types. Some inventors sought to avoid this by having their machines cast types, lines or entire pages for each job. While early experimenters attempted to use the stereotype method, whereby they stamped impressions in paper or soft metal matrices for casting, the ultimately successful method employed re-usable, circulating brass matrices similar to those used in type foundries. One type of machine cast entire lines as a single slug of type metal, the other cast individual types. By 1900 the major developments in field were complete. The machines that incorporated them dominated type composition until the 1960s.

The first successful and most famous of the linecasters was the Linotype, developed by Ottmar Mergenthaler in the United States between 1884 and 1890. Mergenthaler's machine employed much existing technology: a keyboard, an overhead magazine, a typecasting mould, and notches for distribution. His important innovation was to "circulate" and reuse permanent matrices for casting lines of type. Seated at the machine, the operator pressed a key, causing a matrice to slide down a channel to a moving belt that carried it to the assembler. At the end of the line the matrices were justified and transferred to the mould where molten type metal was injected. Almost instantly, the finished slug was trimmed by a revolving blade, ejected and delivered to a galley. Simultaneously, the matrices were lifted to an overhead conveyor which carried them to the correct slot in the magazine.

For justification, Mergenthaler appropriated the invention of J. W. Schuckers, a spacer between each word composed of two opposing metal wedges laid face to face. By pushing from top and bottom, the two wedges slid against each other, creating a wider and wider space until the matrices were pressed against the guides set to the appropriate column width. Mergenthaler was sued for patent infringement and eventually purchased the rights to use this important device.

Two early competitors for the Linotype were the Rogers Typograph (1890) and the Monoline (1892). Like the Linotype, these machines employed reusable matrices and adjustable spacers to cast justified lines of type metal. But they were smaller, lighter, and their mechanisms were different from and simpler than the Linotype. The Typograph, in fact, required no power for operation. Both machines were also cheaper and were therefore very popular with small newspaper offices from the 1890s to about 1910. Both were barred from the United States for infringement on Mergenthaler patents. They were, however, manufactured and popular in Canada and Europe. After the expiration of Mergenthaler's key patents, several American competitors introduced machines similar to the Linotype, incorporating some modifications and improvements. The most important of these machines were the Linograph (1912), a small machine popular in country offices, and the Intertype (1913). An order in 1918 from the Montreal *Star* for 35 Intertypes helped ensure the survival of this firm at a critical point. Both Linographs and Intertypes were manufactured for decades, the latter firm taking over the former in 1944.

While the linecasters were directly operated by a keyboard and produced slugs of type metal, the Monotype separated the keyboard and the casting functions into separate units with different operators. As invented by Tolbert Lanston (1887) and improved by John Sellers Bancroft (1890s), the Monotype employed the technology of punched paper tape. The keyboard operator prepared the tape on one machine, then another operator fed the tape into a free-standing caster, which contained a font of matrices held in a small, square case. Compressed air blown through the holes in the tape caused a mechanism to move the appropriate matrix against a type mould where molten metal was injected. The caster produced whole justified columns of individual types. Justification was accomplished at the keyboard, where as the operator finished the final word of the line a mechanical calculator indicated the required thickness for each space

to fill out the line. The operator keyed in the appropriate number of space units. When reading the tape, the caster adjusted the width of the mould for the spaces in each line.

By separating the slow human work of keyboarding and justification from the rapid, purely mechanical job of casting, the Monotype made economical use of machinery. Several keyboards operated by skilled compositors could keep one caster attended by an apprentice running full time. By using punched tape and justification by calculator, the Monotype also pointed to the direction taken later in the 20th century by those who developed computerized typesetting machines. Though too slow for newspaper work the Monotype was very popular in book and magazine production. Because it produced single types rather than slugs, corrections and the variation of type faces were simpler. The Monotype also surpassed the line casters in setting tabular matter. The Monotype was also mechanically far simpler than the linecaster, allowing it to set a larger variety of characters without a burdensome increase in complexity. As well, the Monotype firm developed a large, high-quality matrix library, making its machines the favourite for fine printing. Printers even used the Monotype caster to produce type sorts for use in hand composition. The Monotype corporation, in fact, instituted a lending library of matrices for printers to use for this purpose.

One final typecasting machine introduced in the period before 1920 was the Ludlow Typograph. While introduced near the end of this period (1909), it was a crude device. It had no keyboard and few moving parts. The operator assembled and justified matrices by hand for the caster to produce a slug of type. But in expert hands the Ludlow was faster than hand composition. It excelled in display work, where a single machine could replace numerous cases of the various display types used in job office. One drawback of the other typecasting machines was that all were limited to the smaller type sizes and hence could not be used for composing large newspaper headlines, advertisements, and much commercial work. Like the Monotype corporation, the Ludlow company developed a large selection of matrices that ensured their machine's popularity for decades.

Typesetting Machine in Canada

The first typesetting machines in Canada were Typographs that went into service at the Toronto dailies, the *Mail*, the *Empire* and the *Globe* in winter 1891. In spring 1892 the Montreal *Witness* installed six Canadian-built Linotypes and that same summer the Toronto *Globe* also took delivery of six Linotypes. In the fall, the Government Printing Bureau in Ottawa brought its complement of Linotypes to six. Initial results on the machines were enough to fuel increased sales, as depression-ravaged publishers sought means to cut their composition costs. By spring 1894 over 80 machines were in operation in Hamilton (10), Montreal (15), Ottawa (11), Toronto (33), Winnipeg (1), Vancouver (7) and Victoria (4). At this time machines were considered by the *Canadian Printer and Publisher* to be still in the "experimental stage." Due to untidy typography, frequent breakdown and a shortage of experienced operators and machinists, their performance was sometimes less than promised by the manufacturers.[176]

But most new machine owners were impressed by the immediate and increasing saving in composition costs. The *Canadian Printer and Publisher* carried frequent reports on the output and cost of composition compared to hand work. The standard for a single hand compositor was 800–1000 ems per hour. Already in 1892 Typograph operators at two Toronto dailies averaged at least 1500 ems. In 1894 Typograph operators at the Chatham *Planet* and Stratford *Herald* averaged about 1800 ems. The Ottawa *Journal* reported that in 1895 its Typograph operators averaged over 2600 ems per hour. The Linotype offered even more dramatic results. In 1896 the *Journal*, which had abandoned its Typographs, reported that its Linotype operators averaged 4500 ems. Over time, these rates continued to increase as the machines and the operators improved. The cost question was similarly in favour of machines. The Ottawa *Journal* estimated that the cost of composing 1000 ems on both the Typograph and the Linotype averaged less than 15 cents. By comparison, the Ottawa union rate for hand composition was 33 cents per thousand. Little wonder that by 1897, one delegate to the Canadian Press Association could

176. Bernard Dansereau, *L'avènement de la linotype : le cas de Montréal à la fin du XIX^e siècle* (Montreal: vlb éditeur, 1992), pp. 28–31; *CPP* (April 1894), pp. 8–9; *CPP* (Oct. 1892), p. 8; *CPP* (April 1893), p. 4.

say that "in these days of progress and keen competition," the machines had become "indispensable."[177]

Figures compiled by the International Typographical Union indicate that the Linotype was by far the most commonly used typesetting machine in North America. Of almost 5000 machines in operation in 1901, 4568 were Linotypes. For Canadian use, however, these figures are misleading. First, the main linecasting competitors for the Linotype, the Typograph and Monoline, were prohibited from sale in the United States but were readily available in Canada. Second, the ITU statistics were gathered only from centres where union locals existed, thus missing many country and small-town printers. Yet these non-union printers in both Canada and the United States were the most likely to use the Typograph, Monoline, Thorne, or Simplex.

Certainly anecdotal evidence from *Canadian Printer and Publisher* reveals that in the 1890s the Monoline and Typograph were very popular with Canadian printers. In 1895 the Canadian Typograph Co. reported 100 machines in daily use. The large dailies, though, soon switched to batteries of the faster Linotypes, whose higher productivity more than covered their higher capital and operating costs. From 1903 onward smaller dailies and job offices also increasingly installed Linotypes. This may have been due either to increasing volume of composition or to the introduction of the inexpensive, Canadian-built 'Baby' or Style B Linotype in 1905. According to the ITU figures, the number of Typographs in union jurisdictions peaked at 103 in 1902 then declined to just 43 by 1908. The Monoline reached its peak popularity in 1905 at 120 machines, though in 1908 106 were still in operation. Virtually all of both types of machine would have been in Canada, and the ITU figures surely underrepresented the total numbers.[178]

177. *CPP* (Aug. 1892), p. 3; *CPP* (March 1895), pp. 13–14; *CPP* (Feb. 1897), pp. 11–12 (quote on p. 13).
178. *CPP* (May 1895), p. 15; *CPP* (Feb. 1897), p. 12; *CPP* (Jan. 1904), p. 18; *CPP* (Nov. 1904), p. 15; International Typographical Union, *Proceedings of the 47th Session* (1901), p. 9; ITU *Proceedings*, (1902), p. 9; ITU *Proceedings* (1904), p. 21; ITU *Proceedings* (1905), p. 23. The *CPP* carried frequent reports of new machine installations. See for example, *CPP* (May 1894), p. 10; *CPP* (July 1894), p. 12; *CPP* (March 1895), p. 7.

It is, unfortunately, impossible to determine how many of the Thornes, Simplexes, and others reported by the ITU were operating in Canada. The *Canadian Printer and Publisher* carried occasional reports of Thornes and Simplexes in Canadian printing offices. The Toronto Type Foundry was agent for both.[179]

Though a late arrival on the Canadian printing scene, the Monotype had a profound impact on commercial printing. The Canadian Printer and Publisher carried a report on the "Lanson" [sic] in 1893. But only in 1902 did the Montreal *Gazette* take delivery of the first Monotype in Canada. Book and job printers in Toronto also soon saw the value of the Monotypes. By 1904 the Bryant Press and Murray Printing Co. had Monotypes. They were soon followed by the Hunter Rose Co., which found to its dismay that "when we go into competition on large composition jobs with offices that have typesetting machines we are simply 'not in it.'" The firm's managers expected the two keyboards and two casters imported from the United States would pay off their purchase price of $7100 in less than three years. By 1905, the Monotype exhibit at the Toronto Exhibition was "the Mecca of all Printerdom." Visiting printers agreed that "for work outside of the regular newspaper ... the Monotype was almost indispensable in the book and job office." After the exhibition, four of the largest printers in Toronto placed orders to buy two or more units each. And the Hunter Rose Co. actually purchased part of the display itself. By 1908 ITU locals reported over 800 Monotypes in North America. While not nearly as popular as the Linotype, which the ITU survey numbered at almost 9000, the Simplex, Typograph and Monoline together totalled barely 250.[180]

Manufacture of Linecasters in Canada

In the 1890s, Canadian daily newspapers were quick to take advantage of the new typesetting machines. But more than this, Canada was soon one of the most important manufacturers in the world. Before its disappearance just before the First World War, the Canadian typesetting indus-

179. *CPP* (March 1895) pp. 2, 7; *CPP* (March 1898), p. 39; *CPP* (Aug. 1899), p. 15.
180. *CPP* (July 1893), p. 5; *CPP* (Aug. 1893), p. 16; Dansereau, p. 104; Hunter Rose Co., Box 3, Minute Book 1, 7 July 1904, Hunter Rose Papers, No. 217, Thomas Fisher Rare Book Library; *CPP* (Sept 1905), p. 29; ITU *Proceedings* (1908), p. 23.

try supplied not only Canadian needs but also those of other countries. It had at one time one of two Typograph factories in the world, one of three Monoline plants, and one of four Linotype operations. The strength of the Canadian manufacturers lay in tariff protection against American imports, the vagaries of patent monopolies, and specialization in well-built, small machines suited to Canadian conditions. The technology itself was all of American origin, though the Canadian firms did introduce their own improvements.[181]

In the summer of 1891 John Redpath Dougall, publisher of the Montreal *Witness*, began building a modified version of the Square Base Linotype at his Linotype Company plant in Montreal. In return for half of all net profits, the Mergenthaler interests in the U.S. granted Dougall exclusive rights to the Canadian patents for this machine and sold him the necessary plans, tools and parts. The American company, unable to keep up with domestic demand for its product, was initially content with this arrangement, which it also followed in Europe. The first Canadian Linotype entered service in February 1892 and by the spring the first six were in operation at the *Witness*. Early sales increases were not dramatic, perhaps due to the machines's price, about $3000, and competition from the Typograph. Two years later, 40 machines were in operation.[182]

In 1904 Dougall sold the Linotype Company to the Toronto Type Foundry, which continued the Montreal operation under the name of the Canadian-American Linotype Corporation. Between 1905 and 1909, this firm introduced several new models, which it sold throughout Canada and exported to South Africa, Norway, Australia, New Zealand, Mexico and Chile. In direct response to competition from the Typographs and Monolines, the firm introduced its Style B Linotype in 1905, featuring fewer parts, stronger construction and simpler operation, and a price of just $1750. Beginning in 1906 the Canadian-American Linotype Company competed directly with imports from the U.S. Mergenthaler Linotype Co.[183]

In 1894, following on the early popularity of the Rogers Typograph, the Dominion (later Canadian) Typograph Co. began building machines in Windsor, Ont. Though prevented from selling in the United States by Mergenthaler patent litigation, in Canada the Typograph was the only serious competitor for the Linotype in the early 1890s. The first Typograph installations were of American-built machines in 1891 at the Toronto *Mail*, *Empire*, and *Globe*. But such large dailies soon switched to the Linotype. The Typograph found its niche in the offices of weeklies and smaller city dailies, who were attracted by its lower price of $1500, sound construction, and simplicity of operation. While slower than the Linotype, it required no machinist, used no power except to heat the type metal, and featured a standard Remington typewriter keyboard. It was best suited to offices requiring a single machine. The Typograph was especially popular in Southern Ontario, due probably to proximity to the Windsor factory. But Typographs were also found in such centres as Winnipeg and Truro. As noted above, the popularity of the Typograph waned after 1900, though as late as 1905 and 1907 some country publishers still recommended it.[184]

The decline of the Typograph can possibly be attributed to introduction of the Monoline, another American invention that was prevented by the Mergenthaler company from sale in the U.S. and was subsequently manufactured in Canada. Initially priced at $1000, the Monoline had obvious appeal to smaller newspapers when it went on the market in 1896. An experienced operator could produce 4000 to 4500 ems per hour on a compact, simple machine that used very little power. The manufacturer, Canadian Composing Co. of Montreal, reported 53 machines in Canadian printing offices by 1900, about half of those in Montreal, Quebec, and Sherbrooke. Among other centres that eventually acquired Monolines were Halifax, Brockville, Welland, Hamilton, Woodstock, Kingston, Nanaimo, Revelstoke and Kamloops. At one time all the French dailies of Montreal except *La Presse* used the Monoline. The company also

181. Dansereau, p. 81.
182. Dansereau, pp. 24–27, 81; *CPP* (April 1894), p. 15.
183. Dansereau, pp. 35–51; *CPP* (May 1905), pp. 16–17; *CPP* (Oct. 1905), p. 5.
184. Dansereau, pp. 28, 52, 63; *CPP* (April 1894), p. 13; *CPP* (March 1895), pp. 13–14; *CPP* (Feb. 1905), p. 23; *CPP* (Feb. 1907), p. 14. The Canadian Typograph Co. directed its ads at the small publisher. See, for example, *CPP* (July 1896), p. 15; *CPP* (May 1897), p. 11; *CPP* (Jan. 1897), inside back cover; *CPP* (Nov. 1897), p. 13.

exported machines to Australia, New Zealand, and Cuba.[185]

The Canadian typesetting machine industry met its demise at the hands of the Mergenthaler interests in the United States. They had long enjoyed an overwhelming dominance of the American market through aggressive patent litigation and regular technical innovation. But the imminent expiry of their key patents beginning in 1910 spurred company directors to establish a more complete international monopoly before the advent of competition. In 1905 Mergenthaler purchased the Monoline patents and all shares of the Canadian Composing Co. In 1909, after several years of spirited competition from the Canadian-American Linotype Co. it bought that firm and its German and British counterparts, thus securing control over world Linotype production. These actions placed the Canadian industry under a cloud. As the *Canadian Printer and Publisher* reported in 1909, continued production in Canada would take "careful consideration" to determine if the "limited demands of the Canadian market will justify the large investment in tools and special machinery" needed to build the new American machines in Canada. By 1911 that same trade publication called on the government to eliminate the 20 per cent duty on U.S. typesetting and typecasting machines, arguing that by that time "there is no industry in Canada which requires ... protection." Mergenthaler stopped Canadian production of the Monoline in 1912, citing low sales and high production costs. Around the same time, production of Canadian Linotypes also ceased. Both decisions were probably abetted by the Canadian government's elimination of the last tariff on typesetting machines.[186]

Photography Applied to Printing

Photomechanical processes to prepare an inkable surface for printing date back to the beginnings of photographic experimentation. The pioneers of photography based their remarkable advances on the tendency of certain chemical substances to change their properties when exposed to light. Just as they sought to achieve these effects in tone to produce images from nature, so too they sought to apply these properties to the creation of printing plates for producing permanent, multiple copies. These experiments involved coating a metal plate or lithographic stone with a substance that would after exposure to light either accept lithographer's ink, act as a resist for etching a relief or intaglio plate, or form a relief of the image for creating an electrotype mould. In 1827 the French pioneer Joseph Nicéphore Niepce and the engraver Lemaître successfully printed several copies from a photosensitized and etched metal plate, becoming the first to exploit photography for printing.[187]

The critical decade where the techniques were proposed that would guide later commercial development was the 1850s. Among the many working along similar lines, certain figures stand out. In 1852 and 1858 William Henry Fox Talbot of England patented methods for producing gravure plates and proposed means for producing halftones, either by use of a gauze or lined glass screen or by sprinkling the plate with powdered, acid resisting resin. In 1854 Paul Pretsch, working in Austria and then England, patented a technique employing gelatin and electrotyping for producing relief plates compatible with letterpress technology. In 1852 Lemercier and several associates in Paris produced photolithographs from stones coated with light sensitive bitumen. Three years later another Parisian, Alphonse Poitevin, patented a more effective method that used a coating of bichromated albumen. Two years later E. I. Asser of the Netherlands devel-

185. Dansereau, pp. 52–65; *CPP* (Aug. 1900), front cover; *CPP* (March 1901), pp. 28–29; *CPP* (April 1906), p. 8. Dansereau's claim that the Canadian firm built and sold 1200 machines between 1895 and 1905 is surely incorrect. In 1906 the firm advertised that just 500 Monolines were in use in Canada, Australasia and Germany. The German machines were probably built in that country, where a second Monoline factory existed as early as 1904 (Thompson, *History of Composing Machines*, p. 110).

186. Dansereau, pp. 65–74; *CPP* (June 1909), p. 29; *CPP* (Oct. 1911), p. 43.

187. Helmut Gernsheim & Alison Gernsheim, *History of Photography from the Camera Obscura to the Beginning of the Modern Era*, Revised Edition (London: Thames & Hudson, 1969), pp. 57, 539–40; David Pankow, "Dungeons and Dragon's Blood: The Development of Late 19th and Early 20th Century Platemaking Processes," *Printing History* 19, 10,1 (1988), pp. 22–23. Pankow provides a helpful list of the principal chemicals employed in photomechanical processes and the properties that make them useful.

oped a means of producing the image on paper then inking and transferring it to stone or zinc.[188]

Despite these important developments none of these processes were yet ready for commercial exploitation. The most important unresolved problem for photomechanical processes was the difficulty in rendering the full range of "half-tones" between simple black and white. Gravure printing reproduced tone by varying the *amount* of ink transferred to any particular point on the page. But this was not possible to any significant extent in letterpress or lithographic printing where ink formed only a thin, uniform film on the printing surface and where the only possible expression of ink was by its absolute presence or its absence. Photoreproduction of tones, therefore, was difficult in the two most important branches of the printing industry. For this reason, the photographic reproduction of line was commercially viable before that of halftones.

Photoengraved Line Blocks

The first application of photography to image production in printing was actually through the medium of wood. As early as 1839 Andrew Fyfe of Scotland had successfully printed a photograph on a coated wood block to guide the engraver's burin. W. E. Newman received the English patent for this practice in 1857 and it was subsequently widely used by pictorial magazines and papers. It was in use in Canada by 1870 and possibly earlier, though it is said not to have come into general use in the United States until the middle of that decade. Photography on the block eliminated the need for a draftsman to first draw the image on wood for the engraver, thus accomplishing an economy for the publisher. Another important result was to reduce the wood engraver to the status of technician preparing facsimiles of originals. In the case of artists' line drawings their facsimiles were very close indeed. In the case of charcoal or crayon drawings, paintings or photographs, they achieved remarkable tonal and textural effects by replacing the engraver's conventional lines with new techniques mimicking the original.[189]

Photoengraved line relief block processes were commercialized in England and the United States in the 1860s and 1870s. Because the printed results so often resembled wood engravings, and were in fact sometimes copies of engravings or of drawings in that style, historians have had difficulty in distinguishing them. The making of a line block involved one of two methods. The first was based on Pretsch's technique employing bichromated gelatin. Spread over a metal plate, this chemical when exposed to light under a transparent positive original would harden and became impervious. Unexposed portions would, when the plate was washed in cold water, absorb water and swell, creating a positive relief image that could be used to make an electrotype mould. This gelatin or photo-electrotype process began to be exploited in England beginning in the late 1860s. In Canada in 1865, the Quebec engraver and electrotyper William Augustus Leggo, who was central to so much North American experimentation in these years, took out patents on a gelatin process called leggotype. In the U.S. John Calvin Moss commercialized another version of this process that used stereotyping instead of Leggo's electrolytic process. In 1876 the *Printer's Miscellany* in Saint John, N.B. was carrying advertisements for the Photo Engraving Co. of New York, whose Moss process was said to provide relief plates that were "An excellent substitute for woodcuts for printing all sorts of illustrations, at much lower-prices."[190]

In the 1890s in North America the photo-electrotyping process, which took up to a week to produce a plate, was almost completely supplanted by zinc etching. This second process was developed in France between 1850 and 1872 and was also known as gillotage. Zinc etching involved exposing a plate sensitized with bichromated gelatine under a negative, then protecting the hardened portions with an acid resist of bitumen or a resin called "dragon's blood." The com-

188. Gernsheim, pp. 540–42, 545–47; Jacob Kainen, "Development of the Halftone Screen," *Smithsonian Institution Annual Report for 1951* (Washington: GPO, 1952) pp. 411–13.

189. Gernsheim, p. 545; Luis Nadeau, *Encyclopedia of Printing, Photographic, and Photomechanical Processes* (Fredericton, N.B.: Atelier Luis Nadeau, 1990) p. 384; Chevrefils, p. 211; Estelle Jussim, *Visual Communication and the Graphic Arts: Photographic Technologies in the Nineteenth Century* (New York: Bowker, 1974), pp. 58–63, 157–60.

190. Pankow, p. 23; Wakeman, pp. 135–36; Canadian Patent, No. 1800 (1865); British Patent, No. 1541 (1865); *PM* (Oct. 1876), p. 44.

pletion of an etched relief block usually required repeated submersion in the mordant after careful reapplications of the resist. This process was greatly simplified by the introduction of etching machines around 1900. Rather than complete immersion, these devices subjected the plate to a fine acid spray, producing a faster and cleaner etching. Zinc etching began to be employed by various firms in England and the United States on a serious scale in 1876.[191]

Halftone Screen

Fox Talbot realized in 1852 that the rendering of tones could only be achieved by breaking the image into lines, dots or specks so tiny and so numerous that they conveyed the illusion of a continuous image. He also proposed the ultimately successful means to accomplish this: placing a glass screen inscribed with lines or dots between the image to be copied and the photosensitive plate. Through the 1850s and 1860s, various researchers published and patented their versions of the halftone screen. By the late 1860s, writes the American historian Jacob Kainen, "most experimenters were generally acquainted with the halftone screen, realized its possibilities, and attempted to perfect it as a mechanical instrument."[192]

In 1869 the Canadian William Augustus Leggo became "the first worker to produce good practical results" using a ruled or dotted glass screen. Leggo's success in the *Canadian Illustrated News*, followed by the New York *Daily Graphic*, was achieved by using photolithography. According to an employee of the *Daily Graphic*, their regular production of photolithographed illustrations "startled the whole printing world, for it demonstrated that photography was going to usurp the place of the wood engraving." Leggo predated by more than a decade the famous "Shantytown" photo of 1880. In that year his former employee Stephen Horgan used a Leggo screen to produce for the *Daily Graphic* an image by conventional letterpress methods. Even then, halftone, etched, letterpress blocks reached no degree of perfection for another decade, by which time the Philadelphians Frederick E. Ives and Louis and Max Levy had perfected the construction of cross-line screens. Just as importantly, Ives had by then demonstrated the optics of screening, by which each opening in the screen acted as a lens, admitting varying degrees of light that created on the plate dots that varied from tiny and widely spaced in the highlights to large and closely spaced in the shadows. Unlike previous screens which had simply broken the image into a hazy series of tiny fragments, this method successfully conveyed the illusion of continuous tone.[193]

Halftone screens first made a significant impact on the letterpress segment of the printing industry. In its final form, halftone blocks were produced by etching a zinc or copper plate coated with bichromated gelatin or albumen that had been exposed to light from a negative through a screen and the unexposed coating washed away. With the addition of powdered dragon's blood, the exposed, hardened coating acted as a resist to the etching solution, creating a raised printing surface of uniform height while all other areas were reduced by the mordant. This basic scheme, with technical improvements to the screening and etching methods and materials, was to persist from the 1890s until letterpress technology was phased out in the 1960s and 1970s.[194]

Soon after halftones became commercially viable, the process was applied to printing full-colour images by printing from three separate plates in each of the primary colours. By this time the theory of primary colours was accepted. And since James Clerk Maxwell's proposal in 1861, the possibility of reproducing coloured images from nature by photographing them through a succession of coloured filters was also known. Over the next thirty years experimenters in Britain, the United States, and on the Continent gradually perfected the necessary processes, which included the halftone screen itself and chemicals to sensitize photographic surfaces to different colours. Some success was achieved in the mid-1880s by Ives in the United

191. Pankow, pp. 24–25; Wakeman, pp. 131–34; Nadeau, p. 117.; *CPP* (June 1899), p. 14; Julius Verfasser, *The Half-Tone Process: A Practical Manual of Photo-Engraving* (London: Iliffe, 1912), pp. 318–29.
192. Kainen, "Development," pp. 412–15 (quote on p. 415); Pankow, p. 26; Gernsheim, pp. 549–50.
193. Kainen, "Development," pp. 415–420 (quote on p. 415); Ralph Greenhill, *Early Photography in Canada* (Toronto: Oxford University Press, 1965), p. 66; Pankow, pp. 27–28; Gernsheim, pp. 550–51; second quote by Stephen Horgan in Jussim, p. 285.
194. For a description of the halftone process before 1920 see *CPP* (Aug. 1915), p. 18; an illustrated and more detailed account is in *Inland Printer* (Oct. 1900), pp. 120–24.

States and Ulrich in Berlin. While some early success came in collotype (see below) and lithography, their unpredictable results and the perfection of the screen in the early 1890s assured that the initial commercial development of colour halftone printing was in letterpress. By 1896 *Penrose Annual* reported that "colour reproductions can now be produced with a degree of certainty not attained in previous years." And by the turn of the century production of colour blocks was a routine matter.[195]

Canadian engraving companies were quick to exploit the new line and halftone block technology. The extent of photo process work in the 1880s is unknown. By the end of that decade, several Toronto firms were offering photoengraving services, though it is not likely that they produced halftones. Halftones did receive mention in 1891 ads for the Hanson Photo-Engraving Co. of that city. Among those active in the field by 1892 were Desbarats & Co. in Montreal, and the Toronto Engraving Co., Canadian Photo-Engraving Bureau, Grip Ltd., Muirhead Photo Engraving Co. and Elliott Illustrating Co. in Toronto. At around the same time or shortly after, John Stovel and Bulman Bros. began producing the first photoengravings in Winnipeg. And in 1894 the Saint John *Telegraph* installed a photoengraving plant in that New Brunswick city. Even the Toronto Lithographing Company saw the potential, or threat, of the new technology. In 1893 it installed a complete photoengraving plant to supply halftones to the trade. By 1897, Canadian Printer and Publisher wrote that "we are at a stage of printing when, so far as illustration is concerned, the halftone rules the world."[196]

The most significant initial impact of photoengraving was felt in job work, where blocks were used extensively for catalogues, magazines, and small commercial work. As late as 1913, a speaker told the Toronto Graphic Arts Board of Trade that "nearly all engravings" were produced for advertising. Magazine and catalogue publishers, stimulated by fine engraving work being done in the United States, quickly demanded and received equally fine work from Canadian firms. According to the *Canadian Printer and Publisher* in 1900, recent years had "witnessed such an improvement in the artistic as well as the practical value of ... catalogues ... that the change might almost be styled a revolution." A good halftone for catalogues, preferably based on a wash drawing rather than a photograph, was said to "produce an effect on the customer similar to that produced by an examination of the articles themselves." Printers wanting to do "first class catalogue work" had to be "an authority on engraving as well as printing." One of the largest users of catalogue engravings was the T. Eaton Co. Its catalogue was for years one of Brigden's biggest sources of business. In fact the Toronto firm established a Winnipeg branch in 1914 expressly to supply artwork and engravings for Eaton's new western catalogue.[197]

One important result of photoengraving both in line and halftone was to allow ordinary job printers to steal back from the lithographers much work in ornate bill- and letterheads. "If you find that a man wants a special design for a heading," one Toronto engraving firm told printers, "why should you drive him into the arms of some lithographer, as you assuredly will do if you try to force a type heading on him." Releasing the job printer from the limitations of the type catalogue, firms bragged that their artists and engravers could produce relief blocks "in exact lithographic style" for printing on an ordinary job press.[198]

In Canadian newspapers, photoengraving had both an immediate and a delayed impact. Already in 1894, the cartoonist Sam Hunter could tell a Toronto meeting of the Canadian Press Association that "this may be truly styled an age of pictorial journalism." Modern engraving allowed the production of illustrations within "an hour's time" and in greater variety and originality than ever before. "Never again," he said,

195. *Penrose Annual* (1896), pp. 33–35 (quote on p. 2); *Penrose Annual* (1901), p. xv; William Gamble, "Modern Colour Processes," in R. M. Burch, *Colour Printing and Colour Printers* [1910] (New York: Garland, 1981), pp. 253–56.

196. Hulse, *Dictionary*, pp. 49, 92, 117, 185; *CPP* (May 1892), pp. 11, 12, 16; *CPP* (June 1892), p. 13; *CPP* (Sept. 1892), p. 32; *CPP* (Oct. 1892), p. 20; Davis, "Business," p. 164; *William Bulman: Western Pioneer* (Winnipeg: Bulman Bros., 1952), n.p.; *CPP* (July 1916), p. 29; *CPP* (Nov 1894), p. 8; *CPP* (June 1894), p. 11; quote in *CPP* (Aug. 1897), p. 10.

197. *CPP* (March 1900), pp. 10, 12; Davis, "Business," pp. 162–63.

198. *CPP* (Oct. 1894), p. 11; first quote from *CPP* (June 1894), p. 2; second quote from *CPP* (Jan. 1895), p. 24; for examples of the type of work produced, see the Toronto Engraving Co. ads in *CPP* (March 1895), p. 27; *CPP* (Feb. 1896), p. 31.

"need that good old stock cut of Lydia Pinkham be divorced from the advertising columns and made to do duty as a portrait of Sara Bernhardt or Queen Lil of Hawaii." Initially, however, this impact was limited to zinc etching of pen and ink sketches or reproductions of wood engravings. Halftones did not print well on rough newsprint, especially if they were first stereotyped for printing on fast rotary presses. Before the First World War, even popular illustrated papers like the Toronto *Telegram* and Montreal *Star* used them rarely. From at least 1894, engraving firms were offering zinc halftone blocks especially made for newspapers by the use of coarse line screens—60 lines per inch compared to upwards of 200 for fine work requiring a copper block, the best inks and glossy papers. But newspaper use of halftones was limited to special supplements, where a slower cylinder press, better ink, and better paper might be used and more time could be taken in preparing the plate for press.[199]

Photogravure

One of the earliest successful applications of *screenless* halftones was photogravure, which Karel Klic, a Czech working in Vienna, perfected in 1879. Klic transferred to a copper plate a "carbon tissue" negative, a relief gelatin print of the image where the thickness of the gelatin corresponded to the degree of light to which it had been exposed. He then etched the plate, the mordant biting into the plate most deeply where the gelatin negative was thinnest (i.e. the dark tones) and least where it was thickest (i.e. the highlights). Thus the plate carried more ink in the darker image areas and progressively less in the lighter areas and highlights. Prior to transferring the negative, Klic had created a grain on the plate by coating it with fine, mordant resisting resin or bitumen dust. The function of the grain was to provide an unetched "tooth" that held ink in the etched cavities and prevented it from being wiped away in the printing process. By the early 1880s, photogravure was produced in Europe, Britain and the United States. In 1893 two Montreal firms, Desbarats & Co. and Sabiston Lithographic Publishing Co. were producing "photo-gravures." The latter's prints for the Toronto Board of Trade were said to be "genuine works of art." *The Times* was moved to remark on the death of a respected hand engraver that the advent of photogravure meant "fine engraving, whether in mezzotint or in line, is doomed." The photogravure plate nevertheless required extensive hand tooling before printing, and because of this expense, photogravure was only used for long print runs. For all but the finest grade work, it was replaced by the more mechanical rotogravure, which is discussed in the next chapter.[200]

Photolithography and Collotype

Photolithography met with some success as a practical process in the 1860s and 1870s, being especially suited to the reproduction of maps, plans, line drawings, and hand-produced lithographs and engravings of all kinds. Photolithography was also early applied to the production of images for illustrated newspapers, an endeavour pioneered by William Leggo and his business partner George-Édouard Desbarats. Using a system devised by Leggo, Desbarats published the world's first halftone reproductions in a periodical with their first issue of the *Canadian Illustrated News* in 1869. In 1873 they began a bold new venture in New York City, the *Daily Graphic*. In both cases, however, Leggo and Desbarats discontinued the use of these illustrations after a few months. The utility of photolithography was limited by press technology, which could produce no more than 700 to 800 impressions an hour, and by the difficulty of printing on the same page both illustration and text, the latter more suited to letterpress. In the longer run, its main failing was the inadequate rendering of continuous halftones. The lithographer employed several techniques to create a "grain" that would break up the image into inkable dots

199. Lydia Pinkham quote in *CPP* (March 1894, pp. 10–11; *CPP* (March 1902), p. 17; *CPP* (Aug. 1915), p. 17; *CPP* (Oct. 1894), p. 9; *CPP* (Sept. 1902), p. 5. For examples of ads for newpaper halftones see: *CPP* (July 1894), p. 24; *CPP* (Nov. 1894), p. 32; *CPP* (Aug. 1899), p. 13; (May 1900), p. 7; *CPP* (Feb. 1904), p. 4. Regarding the poor quality of newspaper halftones, an ad in *CPP* (April 1895), p. 24 by the Toronto Engraving Co. acknowledges that "outline portraits are more satisfactory. The public wants something it can see without putting its glasses on."

200. Charles W. Gamble, *Modern Illustration Processes: An Introductory Textbook for all Students of Printing Methods* (London; Isaac Pitman, 1933) pp. 172–76; Gernsheim, p. 544; Wakeman, pp. 99–101, 126–27; Kainen, "Development," pp. 420–21; Canadian reference in *CPP* (Nov. 1893), p. 9; final quote from Dyson, p. 74.

to approximate gradations in tone. But the results were, according to one observer, "rough and broken," lacking the peculiar "strength and softness" of the best lithographic chalk drawings that had made the medium such an attractive one for art reproduction work. Because of these drawbacks, lithographic halftone use declined during the 1870s.[201]

Photolithography was supplanted in much tonal illustration work by the related technique of collotype, also known as albertype, heliotype and other proprietary names. This system originated with Poitevin's lithographic work but did not require a printing stone or metal plate. Collotype exploited the special property of bichromated gelatin, which when exposed to light under a negative became capable of accepting ink in proportion to its degree of exposure. Moreover, when the gelatin printing surface dried it reticulated, forming a natural grain of tiny wrinkles that helped convey the effect of natural tonal variation. As early as 1876, William Lawson of Fredericton, N.B. was working in Boston on the heliotype version of this process. In the 1880s two Desbarats firms, George-É. Desbarats & Co. and Canada Bank Note Co., were working the "Artotype" system. In Toronto, Hunter Rose & Co. also was producing collotypes. Collotype produced fine, rich images but it was a slow, finicky, expensive process that depended, among other things, on careful humidity adjustments in the pressroom during printing. It steadily lost ground during the twentieth century to photogravure and later to offset photolithography using halftone screens, which, though incapable of collotype quality, could produce longer runs at higher speeds. Offset photolithography will be discussed in the next chapter.[202]

201. Jussim, pp. 284–85; Kainen, "Development," pp. 415–16; Wakeman, pp. 89–95; Gernsheim, pp. 546–47; C. Gamble, pp. 201–4, 209–15; Greenhill, p. 67; quote by J. Waterhouse in *Penrose Annual* (1900), p. 17.

202. Gernsheim, pp. 547–49; C. Gamble, pp. 218–28; Wakeman, pp. 111–18; *Printer's Miscellany* (Aug. 1876), p. 16; Greenhill, pp. 67–68. For a detailed recent study of collotype see Tom Reardon & Kent Kirby, "Collotype: Prince of the Printing Processes," *Printing History*, 14,1 (1991), pp. 3–18.

Technological Change and Workers' Response

Technology, both machinery and the knowledge and practices that govern its operation, involves the means by which labour is applied to the conversion of raw materials into finished products. Technological change, therefore, is really about change in the labour process, in the work lives of those on the shop floor. In the period between 1880 and 1920, machines and practices introduced by employing printers eliminated or transformed old jobs and created new ones. In general, printing workers through their unions successfully negotiated these changes, preserving jobs and acquiring new skills. In no small part this was due to their high existing level of skill, which was either still necessary or could be effectively redeployed, and their membership in strong unions that could restrict the employers' supply of labour and control the operation of new processes.

Even before 1880, new technology was making press work a specialized trade distinct from that of the compositor. The new cylinder presses also created jobs for unskilled press feeders who were even less tied to the old craft tradition of printing. This process of differentiation and specialization accelerated after 1880. Increasingly, a pressroom hierarchy emerged with numerous semi-skilled "juniors" finding tenuous places beneath the cylinder pressmen and web press operators. Junior printers helped cylinder pressmen with make-ready and fed sheets into the presses. They also operated the platen job presses. Pressmen generally were recruited from the ranks of juniors with three to four years experience, but no formal apprenticeship system seems to have existed and not all achieved journeyman status.[203]

In Toronto in 1900 pressmen earned slightly better wages than compositors, about $13.50 per week compared to $12 for typesetting. Feeders earned $7. In Montreal pressmen earned the same wage as compositors, between $10 and $12 per week. Boys feeding presses could expect $5–7 but girls received just $4–6. Boys could also hope to gain promotion to journeyman but girls had little likelihood of better prospects. In fact, press assistants in this period increasingly appealed to their rights as men to receive wages sufficient to support a family, in the process

203. Baker, pp. 146–47.

establishing their work as an exclusively male domain.[204]

A more elaborate subdivision of labour occurred on the rotary presses. The largest newspaper machines required ten or eleven hands, of which only one or two aside from the foreman were considered pressmen. Also needed were various helpers, including a brakeman or tension man who controlled slack on the paper feed, paper handlers who manoeuvred the massive rolls into position and removed paper waste, and flyboys or carriers who removed papers from the delivery board and took care of spoiled copies. In addition, large plants might also employ labourers to oil and wash components and perform routine maintenance, work done in smaller operations by the pressmen.[205]

Of all these workers before 1889, only the cylinder pressmen consistently enjoyed union protection. Separately chartered pressmen's locals of the ITU were established in Ottawa (1880), Toronto (1883), and Montreal (1887). Between 1890 and 1893 these unions joined the International Printing Pressmen's Union, formed in 1889 by a secession of disgruntled pressmen from the compositor-dominated ITU. Outnumbered by compositors five to one, the pressmen had grown weary of compositors' pretensions to superiority, given the pressmen's operation of complicated, costly, and, for owners, profit-making machines. But the exclusiveness of the pressmen's trade was threatened by the newspaper web pressmen, who were forming their own unions (including one in Toronto), and the juniors, who were claiming the right to pressmen's jobs without having performed traditional apprenticeships. In 1896 the IPPA was renamed the International Printing Pressmen's and Assistants' Union, representing successful efforts in the 1890s to accommodate assistants and web pressmen. But throughout the period before 1920, and indeed beyond, conflict erupted over such issues as the right of cylinder pressmen to work on newspaper rotary presses.[206]

The introduction of typesetting machines into the unionized newspaper composing room has become a case study in the literature of industrial relations and technological change. Employers installed typesetting machines in order to reduce their composition and, hence, labour costs. This was not done entirely to reduce their work forces but also to allow an increase in the volume of printed matter to meet increasing demand. Composition had become a bottleneck in a production process that had otherwise been transformed. In the daily newspaper business, where late-breaking news was a valuable commodity, the machines would allow publishers to set last-minute stories without keeping large numbers of hand compositors on call.

Nevertheless, it was anticipated that, as the *Canadian Printer and Publisher* stated, the coming of the typesetting machine would "bear heavily on the compositors as a class."[207] Depending on skill and experience, one machine operator could produce as much as three to five hand compositors. Other consequences that might have been predicted were a displacement of skilled compositors by underpaid and ill-trained boys or women, fears later confirmed by their use as strikebreakers in newly mechanized shops. Consequent on this might be an erosion of the power of the typographical unions to defend the interests of their remaining members. That the effects were less serious than expected can be attributed to a number of factors, not least of which was the success of the unions in negotiating with employers for an orderly and equitable transition to the new technology.

Following policies established by the ITU between 1888 and 1891, the local typographical unions in Canada pursued a consistent approach to the new technology. They did not resist introduction of typesetting machines. Instead they insisted they be run by union print-

204. *CPP* (Oct. 1900), p. 9; Christina Burr, "Defending 'The Art Preservative': Class and Gender Relations in the Printing Trades Union, 1850–1914," *Labour/Le Travail* 31 (Spring 1993), pp. 60–63. Considering the wage rates earlier established for typesetting machine operators, these wages must either have been for job compositors or compositors in non-union shops. See below.

205. Baker, pp. 147–50.

206. Kealey, "Work," p. 96; Baker, pp. 60–63, 73, 147, 162–211. Part of the disagreement between the cylinder and rotary pressmen was based on the more invovled make-ready required to print from the form on a cylinder press as opposed to printing from stereotype plates with soft cylinder packing on newspaper rotaries. The web pressmen replied that their machines were far more complicated and represented a greater financial investment. See Baker p. 183.

207. *CPP* (Sept. 1892), p. 1.

Mergenthaler Linotype advertisement, 1909: "One Linotype vs. Five Compositors." (Canadian Printer & Publisher)

ers, not apprentices or unskilled operators. They also insisted, after some hesitation, on payment by time rather than the traditional practice of piece work. And they demanded a reduction in the work day from nine to eight hours. As a concession to employers, they agreed to a lower, learner's pay scale for a brief period while a compositor acquired the necessary competency on the machines.[208]

Employers acquiesced to these demands for several reasons. First, despite the hopes of many, they soon learned that the skills of a printer—in the use of hyphenation, capitals and punctuation and the detection of transposed characters and spelling errors—were still needed. "Operating a keyboard is mere manual labor," wrote the *Canadian Printer and Publisher*, "...but to turn out work fit for publication requires some brains and a little education." As well, employers still required hand compositors to set headlines and display ads, as well as to perform the highly skilled jobs of make-up and imposition. Given union control of most composing rooms, the least disruptive option for employers was to accept union operators. Regarding the eight-hour day, the union could demonstrate that the machines were effecting a saving of one or two hours per day in unproductive distribution time. By reducing by one hour the work day for machine operators employers were not in fact losing productive time.[209]

The only areas of conflict remaining were the issues of time versus piece work and the appropriate rate for either. These were the questions on which the strikes in the 1890s were fought. The stakes were high because no one could yet tell the ultimate capacity of the new machines. The employers feared a time rate that would encourage operators to work at far less than the machines could produce. The unions feared a piece rate that was too low, requiring a debilitating work pace. The unions therefore came to favour a time rate that would pay operators at least as much as they had earned on piece work at the case. In 1892 workers at the Toronto *News* struck for seven weeks, finally winning on the major issues of machine control, shorter work week, and a weekly wage of $14. In return they accepted that members would have to meet a minimum level of competency. A year later printers at the Vancouver *News-Advertiser* also struck over wages, though this time both sides accepted the principle of time payment. Workers at *La Presse* in 1894 won without a strike the eight hour day and a minimum weekly wage of $11–15. In 1896, finally, union printers at the Winnipeg *Tribune* succeeded after a month-long strike in replacing the piece rate with a weekly wage of $19.[210]

The introduction of machines in newspaper offices during the depression of the mid-1890s did throw compositors out of work as employers concentrated on reducing costs. In 1894 the Toronto Typographical Union estimated that 77 compositors had lost their jobs from the introduction of 33 machines. This figure conforms to the general pattern in North America of about two hand compositors being eliminated for each machine installed. The burden of unemployment fell most heavily on older printers who specialized in setting straight matter and who could not learn to use the new machines or switch to display composition. To find them a place, the ITU extended its jurisdiction over proofreaders, assigning this work to older members wherever possible. To spread the burden of joblessness, the local unions assessed employed members for unemployment benefits and asked them to take unpaid days off, their work being assigned to substitutes on the unemployment rolls. Despite these efforts, many older printers were forced to find work in the commercial sector where hand composition was still the norm; as late as 1920,

208. George E. Barnett, "The Introduction of the Linotype," *Yale Review* (Nov 1904), pp. 256–57.

209. Barnett, pp. 270–73; Gregory Kealey, *Toronto Workers Respond to Industrial Capitalism, 1867–1892* (Toronto: University of Toronto Press, 1980), p. 97; Wayne Roberts, "The Last Artisans: Toronto Printers, 1896–1914," *Essays in Canadian Working Class History*, Gregory Kealey & Peter Warrian, eds. (Toronto: McClelland & Stewart, 1976), pp. 125–26, 135.; quote in *CPP* (July 1893), p. 4. While most authorities view the successful ITU strategy as a victory for printers, some historians argue it created a male monopoly of the new technology, sacrificing the opportunity for women to learn the machines and further marginalizing them within the printing industry. See: Burr, "'That Coming Curse,'" pp. 357–66 and "Defending," pp. 51–59.

210. Kealey, *Toronto*, p. 96; Zerker, pp. 120–24; *CPP* (Aug. 1892), p. 12; *CPP* (Nov. 1892), p. 14; *CPP* (Jan. 1893), p. 10; Dansereau, pp. 120–21; *CPP* (Aug. 1892), p. 2; Bryan Dewalt, "Arthur W. Puttee: Labourism and Working-Class Politics in Winnipeg, 1894–1918" (Master's Thesis, University of Manitoba, 1985, pp. 45–48.

a survey of Toronto commercial shops showed that hand compositors outnumbered machine operators 711 to 161. Those not lucky enough to find work in job shops emigrated to small towns where the machines had not yet been introduced or quit the trade entirely.[211]

Across North America within a few years, however, composing room employment returned to and even surpassed pre-machine levels. Membership in the Toronto Typographical Union, for example, fell in 1893 and 1895 but by 1897 had recovered to previous levels. It continued to increase until the First World War, despite defections of photoengravers, stereotypers and electrotypers to form their own unions.[212]

An early authority on linotype introduction concluded that from 1897 onwards new machines were no longer displacing workers but expanding production. That the use of machines was followed by increased production and eventually more jobs may be seen in the case of *La Presse*. In 1894 the Montreal popular daily installed four Linotypes to handle composition for a four page daily newspaper. Four years later the number of machines and the number of pages had doubled. By 1908 the number of machines had again doubled and by 1910 had risen to 20. Not long after, the size of the paper rose to 40 pages. Not surprisingly, the number of composing room employees during this same period also increased.[213]

The increase in composing room employment was not due just to the need for more machine operators. First, the availability of cheap machine-set copy soon weakened the market for "plate matter," which had long been a staple for small newspapers and effectively deprived compositors of work. Second, increases in newspaper size were largely fuelled by growing advertising lineage. Until the First World War most display ads were still set by hand, as the Linotypes could not handle the large and varied type styles required and the Ludlows were not yet in general use. For the same reason many headlines also required hand labour. Finally, highly skilled hands were still required in the make-up and imposition of forms. The typesetting machines also created a new trade within the composing room, the machinist who maintained and repaired the apparatus. Wisely, the International Typographical Union extended jurisdiction over these workers, ensuring complete control of the machines.[214]

Despite the compositor's relatively swift and advantageous adaptation, the typesetting machines did have a lasting and disquieting effect on the trade. The days of the "all round printer" versed in all aspects of a unified trade were numbered, though such workers persisted for decades in small printing offices long after they had disappeared from the newspapers and large commercial printers. Already the pressmen had split off into a separate craft union and just after the turn of the century the stereotypers and electrotypers and the photoengravers had done the same. Even before typesetting machines there had been a division of labour among compositors, some specializing in straight matter, others in display work or make-up. The advent of machines and separate scales for hand and machine labour further solidified this division.

Quite apart from any artisanal nostalgia, the ITU perceived danger for their members in this process. On the one hand, workers with specialized skills, like commercial artists and photoengravers, were performing much commercial work formerly done by hand compositors. On the other hand, a decadent apprenticeship system had been for years turning out overspecialized young printers who knew little of the trade as a whole and whose education in both typography and basic English was inadequate. This concern was expressed at a meeting of the Toronto Typographical Union:

> *... in a few years at most ... our art will be represented by specialists and incompetents, and the workmen who will be capable of doing any work that comes into a composing room will be almost extinct.*[215]

The experience of the typesetting machines had taught the unions that dependence on a single skill, the hand setting of straight matter, had made some members unemployable and had weakened the craft status of all. They also realized that what had allowed many compositors to

211. *CPP* (April 1894), p. 9; Barnett, 263–264; Harry Kelber & Carl Schlesinger, *Union Printers and Controlled Automation* (New York: Free Press, 1967), p. 9; *CPP* (June 1920), p. 42.
212. Barnett, p. 255n; Zerker, pp. 326, 329–30.
213. Barnett, p. 255; Dansereau, pp. 30, 135.
214. *CPP* (Feb. 1899), p. 20; Barnett, pp. 254–55; Kelber and Schlesinger, pp. 20, 27.
215. Roberts, p. 136.

adapt either to display composition or to machine work was their general training in typography and the fundamentals of English, acquired through a long apprenticeship in all aspects of composing work. The union believed that the only way for compositors to maintain their status and privileges within the industry was to continue to be educated, adaptable workers. On the one hand, they encouraged their members to learn how to operate the new machines. On the other, they slowly evolved a plan for the ongoing education of their members. In its final form, ITU Course in Printing was a correspondence program giving members a grounding in lettering, design and colour, typography and job composition, imposition, punctuation and capitalization.[216]

As a result of the adoption of photomechanical processes, several trades expanded or emerged while others declined. The appeal of photomechanical reproduction was the elimination of the hand of the engraver as a mediator between the original image and the final viewer. This was partly a desire for the creation of more realistic images. As *Canadian Printer and Publisher* said in 1897,

> *The wood-cut ... always has in it something that is not in the original, something which belongs to the engraver and expresses his individuality. The half-tone, on the other hand, has no egotism, and is a true fac-simile of what it reproduces.*[217]

But another important reason was financial; a photoengraving took less time, and hence less labour and less money to produce.

But photoengraving did not eliminate hand labour entirely. Metal plate and wood engravers saw their crafts eclipsed, but there remained some demand for their services, the former to hand tool photomechanical plates in the finishing process, the latter to cut a limited number of engravings for commercial work. Photo blocks required hand tooling and re-etching in order to achieve the illusion or reality that could not be achieved photomechanically—to refine highlights, accentuate desired features, etc. And the wood engraving was still "indispensable" for images reproducing much fine detail on coarse paper like newsprint.[218]

Engraving and lithographing firms, able to supply more elaborate, more numerous and less expensive illustrations, required more commercial artists to produce original designs and images. Beginning in the 1890s, a commercial art sector emerged in major Canadian printing centres like Toronto, Montreal and Winnipeg. Generally employed by the large engraving and lithography firms, many of Canada's premier painters and illustrators—Charles Comfort, J. E. H. MacDonald, Arthur Lismer, Frederick Varley, Frank Johnston, A. Y. Jackson, and Franklin Carmichael—learned their skills and made their livings producing designs and illustrations for labels, advertisements, and catalogues. In many ways they assumed the creative control of images once held by the hand engravers, though this power was sharply circumscribed by commercial considerations. According to the *Canadian Printer and Publisher*,

> *The point of view of editor, and the manufacturer of the commonest daily necessity ... must be taken ... by the commercial artist, so that his mind becomes like the proverbial chameleon with a capacity for changing color, twenty-four times a day.*[219]

In this period, the artificial distinction between "fine" and "commercial" art emerged, conferring status on the former and income on the latter, though most fine artists also worked in the commercial sector. The old hand engraving trades, now cleansed of their commercial taint, were appropriated by the fine artists and elevated to a new status.[220]

The engraving firms also employed an entirely new trade, the photoengravers. Within this trade

216. ITU *Proceedings* (1908), pp. 16, 142–44, 252–53; *Typographical Journal* (Jan 1908), pp. 21–22; *Typogrpahical Journal* (April 1908), pp. 364–66. For a list of lessons in the ITU course see *Typographical Journal* (Jan. 1914), n.p. Burr would also argue that the maintenance of craft status depended on the successful "gendering" of machine labour as a skilled and hence manly occupation, unsuitable for women or boys. Apprenticehip, in which machine operation was considered an indivisible part of a broader trade, thus reinforced this justification for a sexual division of labour. See: Burr, "That Coming Curse,'" pp. 347–48, 351, 358, 364–66.
217. *CPP* (Aug. 1897), p. 10.
218. *CPP* (July 1899), p. 14; *CPP* (Aug. 1915), p. 20.
219. *CPP* (May 1907), pp. 23–24.
220. For information on Toronto commercial artists see *CPP* (June 1895), pp. 12–13; *CPP* (July 1895), pp. 11–12; *CPP* (Sept. 1895), p. 6; *CPP* (Dec 1895), p. 6. For a study of the relationship between commercial and fine art in this period see Angela Davis, "Business."

individuals often worked at specialties—operating cameras, stripping negatives, etching plates, finishing plates, etc.—though one person might also perform all functions. Given the heavy use of solvents, acids and other toxic chemicals in primitive conditions, the work of photo process workers was hazardous and debilitating. As with other new printing trades that emerged to operate new technologies—the pressmen, electrotypers and stereotypers—photoengravers broke from the ITU to form their own union. In 1903 the International Photoengravers Union was established. The first local in Canada was formed in Toronto the same year to fight low wages, unlimited use of apprentices, and unregulated working hours. After a strike in 1904 the photoengravers won recognition and a three year agreement with the large Toronto firms. According to one authority, photoengravers working for Brigden's firm in 1906 earned on average $500 per year, ranging from $250, presumably for apprentices, to $1000. Despite the union gains, only the best paid earned as much as Toronto compositors or pressmen.[221]

221. Pankow, p. 25; Davis, "Business," pp. 110–12, 204–7.

3 Letterpress Ascendant, Alternatives Emerge, 1920–1960

In early 1956 Murray Printing and Gravure Ltd. moved into its huge, new plant one mile north of the Toronto suburb of Weston. Located in a field surrounded by farms and forest, the plant consisted of "five acres of concrete on one floor and under one roof." In it, 600 people in letterpress and rotogravure divisions turned out millions of magazines, catalogues and other products every month. The plant was built to accommodate the future growth that seemed assured in the economic boom begun during World War II. The company ran its presses at top speed, not only to meet demand but because its managers were convinced that most equipment would be obsolete in ten years. "When you are running, run it as fast as it will go," said one. "Run it into the ground—then scrap it and buy faster equipment. If you don't your competition will."[222]

This frenetic atmosphere was in marked contrast to the unstable period between 1920 and 1940, when the bad years outnumbered the good and many printers went out of business. Nevertheless some features of the later period originated earlier. Printed products were becoming increasingly sophisticated and colourful as "marketing" and promotion, advertising and packaging became even more central to the functioning of the economy. In technological terms, speed and labour productivity were paramount—automatic presses displaced hand-fed presses in most plants. To run these presses at higher speed, fast drying inks were formulated and heaters were installed on presses to hasten drying. In addition to speed, colour printing also became a necessity. And finally, the diversity of printed products was met by a variety of new or previously little used technologies, most notably rotogravure, offset, screen, and flexographic (or rubber plate) printing.

222. *CPP* (March 1956), pp. 33–34.

Part 1 – Printing and Canadian Society, 1920–1960

Canada in the years between 1920 and 1960 completed its transformation from a largely rural society whose economy was dominated by agriculture and natural resources to an urban and increasingly suburban one. Though still dependent on its natural products, Canada was developing a complex economy around this core in consumer goods manufacturing, transportation, communications, and business and government services. Between 1921 and 1961, the population more than doubled and of this a steadily increasing majority lived in cities. The percentage of the labour force engaged in agriculture plummeted from 33 to 10, while in manufacturing it increased from 17 to 22. But the most notable trend was among workers in trade, finance, services and government, whose numbers swelled from 28 to 47 per cent of the labour force. Most of this increase occurred after World War II.[223]

The transformation of Canada in these years was not smooth.[224] The period between the two world wars was marked by economic instability and distress, felt as much in the printing industry as elsewhere. After World War I, Canada was beset by a devastating flu epidemic, a labour revolt, and several years of economic dislocation as war production was wound down and thousands of soldiers were demobilized. Though the worst of the recession ended in 1921, significant growth did not resume until 1924. And the proceeds of this spurt, which lasted until 1929, did not touch all regions and all classes.

One significant feature of economic growth in the 1920s was the increasing importance of con-

223. Figures calculated from data in Leacy, ed. *Historical Statistics of Canada*, 2nd Edition (Ottawa: Statistics Canada, 1983), Series D8–85.

224. For an overview of Canadian social and economic history in this period, see: Bumsted, *Post-Confederation*, pp. 174–207; 274–302, 343–62.

sumer goods like automobiles, electric home appliances, phonographs and radios, cigarettes and prepared foods. This trend was slowed during the depression of the 1930s, when the collapse in world prices for Canada's resources, plus widespread drought on the prairies, shattered the foundations of this emerging economy. At the depths of the depression joblessness afflicted almost one third of the labour force. While World War II ended unemployment for most, consumption was restricted by rationing and wartime restrictions on materials.

With the end of war, however, pent-up demand plus a population boom from births and immigration fuelled a long, steady increase in consumption and production of goods of all kinds. This was both the result and cause of economic prosperity based on high demand for Canada's resources from the similarly booming United States, and increased government spending on such infrastructure as schools, highways, airports, telecommunication systems, and pipelines. Increasing numbers of men and women made their living in a service sector, either private or public, not directly engaged in the production of resources or finished goods. Their lives were on average becoming more prosperous and more secure, the latter due to a halting but decided assumption by government of the power to encourage economic growth and stability and, through social programs, to protect individuals from the worst effects of economic misfortune.

The social model of the 1950s, though not the universal reality, was of a male breadwinner with lifelong employment in a large firm or government department earning sufficient income to support a wife and several children in suburban comfort. Much of this work involved the processing of information. And the medium through which it occurred was largely paper in the form of printed publications and forms. At home, the nuclear family surrounded itself with the accoutrements of the good life—a car, modern appliances, a television, processed foods, books, newspapers and magazines. The family was encouraged to buy these products through advertising, packaging, catalogues and other printed material and through the new electronic media: radio and television.

During this forty year period of momentous change, the printing industry held its place in the middle ranks of Canadian manufacturing. Accounting for 2.8 per cent of manufacturing production in 1920 and 3.7 per cent in 1960, it began and ended the period as tenth among major industrial groups behind such concerns as food and beverages, wood and paper products, iron and steel and transportation equipment. In 1920 and 1960 it was the eighth largest employer, its share of manufacturing employment rising from 6 per cent in 1920 to 8 per cent in 1960. As industry advocates liked to point out, the output of printing and publishing was magnified by more than fifty per cent if other industries that performed printing, like packaging and miscellaneous paper goods, were counted. Although every province could boast a printing and publishing industry, as in the past, the bulk of the industry remained in Ontario and to a lesser extent Quebec. Ontario alone accounted for more than half of all printing output and employment.[225]

Despite its consistent place in the Canadian industrial structure, printing's fortunes were governed by the same vicissitudes as the economy as a whole. The industry experienced little growth during the 1920s, and that which did occur happened after steep declines and frantic price-cutting early in the decade. As late as 1927, commercial printing was an unstable sector, where even under the best conditions shops were said to "easily consume the volume of work available." "Limited and fluctuating volume of work is their principal obstacle to rapid progress."[226] The 1930s began with an even more catastrophic decline than a decade earlier and ended in slower recovery. The value of printing production in 1940 still remained below 1930 levels. Most commercial shops that survived the

225. Leacy, Series R162–483; *CPP* (Jan. 1959), pp. 22–23.
226. *CPP* (Jan. 1928), p. 45.

decade on the sporadic supply of job work did so by putting their workers on short hours.[227]

Substantial growth occurred in the 1940s as a result of the war. In 1941 the level of output finally exceeded the record established in 1929. From that year onward new records were set annually. This continued after the war, as newspaper circulations and ad revenues increased, book and catalogue producers tried to catch up with backlogs, and more printed matter was consumed in goods production. The *Canadian Printer and Publisher* reported that "literally thousands of firms" needed "new descriptive literature"—manuals, parts books, assembly instructions—for their products. And more so than ever before, printed paper was being used in packaging.[228] Between 1950 and 1960 printing outpaced growth in manufacturing as a whole. Between 1950 and 1956, output grew at a rate of 8–10 per cent annually. More and more printed paper was being consumed: by a growing and increasingly affluent population; by advertisers hoping to further build sales; and by business and government trying to control their increasingly complex operations.[229] One industry expert summed up the situation in 1957:

> *Printing, as the most indispensable aid of government, finance, business, industry, education, religion, public information, and every other social area of communications and record-keeping, reflects the dynamics of Canada's surging growth.*
>
> *Every imaginable manufactured or processed product either is printed, labelled with printing, or put in a printed package before it goes to market. This is one great change affecting printing which has largely come about in the last generation.*[230]

The printing industry continued to have some features that distinguished it from other manufacturing sectors. Plants remained smaller and employed fewer workers than the average factory, the difference actually increasing over the forty year period. Though the number of employees per print shop increased after World War II, a considerable proportion of the industry continued to be made up of small shops. In 1960 almost half the establishments were owned by individuals or partnerships. More than half of all plants had shipments of less than $50,000. These small establishments accounted for just 8 per cent of employment, an average of three workers per shop, and 5 per cent of factory shipments. On the other hand, four per cent of all plants, corporations with sales over $1 million, accounted for half of all printing employment and almost two thirds of all shipments. These 145 large establishments employed on average 261 workers each.[231]

Within the industry, the sectors that emerged before 1920 became more firmly established. Government statisticians divided the industry into several groups according to their primary areas of business. The largest was "printing and publishing," which comprised production of newspapers and periodicals printed in the publishers' own plants. Until the 1940s it made up slightly more than half of the industry, though its share declined slightly after World War II. "Printing and bookbinding" corresponded to the traditional job or commercial sector and consistently accounted for about one third of the industry. Firms primarily devoted to lithography were counted separately. Until the 1950s this group held between 8 and 10 per cent of the print market. But by 1960 its share had risen to 15 per cent. Specialty services to the trade—typesetting, engraving, and plate making—made

227. *CPP* (Jan 1932), pp. 32–47. For detailed data on output in the entire period under study, see: Dominion Bureau of Statistics, *Report on the Printing Trades in Canada, 1920*, Cat. No. 36-203, p. 2; DBS, *The Printing and Publishing Industry in Canada, 1929–1930*, Cat. No. 36-D-25, p. 2; DBS, *The Printing and Bookbinding Industry in Canada, 1929–1930*, Cat. No. 36-D-24, p. 2; DBS, *The Lithographing Industry, 1930–1931*, Cat. No. 36-D-22, p. 2; DBS, *The Engraving, Electrotyping and Stereotyping Industry and the Blue Printing Industry in Canada, 1930*, Cat. No. 36-D-21, p. 2; DBS, *Trade Composition, 1930*, Cat. No. 36-D-26, p. 1; DBS, *The Printing Trades in Canada, 1940*, Cat. No. 36-203, pp. 5–6; DBS, *The Printing Trades, 1950*, Cat. No. 36-203, p. 7,; DBS, *General Review of the Printing, Publishing and Allied Industries, 1960*, Cat. No. 36-203, pp. 14, 20; Leacy, Series R1–22.
228. *CPP* (Jan. 1947), p. 29.
229. *CPP* (Jan. 1956), p. 45.
230. *CPP* (Aug. 1957), pp. 45–47.
231. Calculations based on data in DBS, *Printing Trades, 1920*, p. 2; DBS, *Printing and Publishing, 1929–1930*, p. 2; DBS, *Printing and Bookbinding, 1929–1930*, p. 2; DBS, *Lithographing, 1930–1931*, p. 2; DBS, *Engraving, Electrotyping and Stereotyping, 1930*, p. 2; DBS, *Trade Composition, 1930*, p. 1; DBS, *Printing Trades, 1940*, pp. 5–6; DBS, *Printing Trades, 1950*, p. 7,; DBS, *Printing, Publishing and Allied Industries, 1960*, pp. 14, 20; Leacy, Series R1–22.

up about 8 per cent of the industry. While some printers and publishers also did job work and some printers and bookbinders printed newspapers and increasingly employed lithography, these categories were distinctive enough to persist during the 1920–1960 period.[232]

Newspapers, magazines and other periodicals printed by their publishers consistently accounted for about 40 per cent of all shipments of printed matter. In 1940 daily newspapers alone represented one third of all printing production. The second largest group of products encompassed job printing and stationery—business and legal forms, cheques and bank notes, labels, greeting cards, etc.—and totalled about 30 per cent of sales. Advertising fliers, calendars, folders, etc. constituted about 10 per cent of the industry's output. Perhaps surprisingly, printed books were not a major product. Included with catalogues or blank books and scribblers by government statisticians, this category accounted for about 5 per cent of production. In this period, the handful of Canadian book publishers survived by acting as agents for foreign firms and by issuing textbooks. The latter were the most lucrative line for Canadian publishers in the post-war period.[233]

Despite the continuing significance of daily newspapers within the printing industry, this sector passed through a wrenching consolidation. The number of daily newspapers fell from 143 in 1911 to 113 in 1921 to 103 in 1931 to 97 in 1938, the same number as had existed in 1898. This was a decrease of 32 per cent, but during the same period the combined circulation of all papers increased by 60 and the average circulation per daily increased many times over. Also increasing was the number of pages per issue. After World War II, the general prosperity of the country contributed to a boom in advertising revenues, and the number of dailies was augmented by the conversion of some weeklies in smaller centres. But the consolidation process continued, as insurmountable costs for necessary new presses further weakened the smaller circulation papers in competitive city markets. In the 1950s alone, the Edmonton *Bulletin*, Vancouver *Herald*, and Montreal *Herald* were closed and both the Vancouver *Sun* and *Province* and Victoria *Times* and *Colonist* merged their production and business operations. In smaller cities, consolidations, mergers or closings usually left one daily with a local monopoly. In this period also, many daily papers were acquired by large, well-capitalized chains like those of the Southam, Thomson, Sifton, and Bell families. In 1953 11 firms controlled almost half the daily newspapers in Canada.[234]

In the periodical field, publishers struggled to establish a handful of indigenous magazines. While farm newspapers and trade journals could successfully appeal to a specialized audience, general interest magazines faced powerful competition from American journals that could support editorial and production costs with huge circulations. A few Canadian periodicals like *Maclean's*, *Chatelaine*, *Canadian Home Monthly*, and *Canadian Home Journal* achieved circulations in the 250,000 range by 1940. In addition, the Toronto *Star Weekly* enjoyed a national circulation of 323,000. The most popular French language periodicals were weeklies, either in newspaper form, *La Patrie* (100,000) and *Le Petit Journal* (84,000), or in magazine form, *Le Samedi* (50,000). One notable development after World War II was the formation of *Weekend Magazine*, a rotogravure newspaper supplement, from the merger of the Montreal *Standard* and the Saturday edition of the Montreal *Star*. More disturbing was the rise of new American rivals in the form of Canadian editions of *Liberty*, *Time*, and *Reader's Digest*. The latter soon had the largest circulation of any magazine published in Canada.[235]

The beleaguered status of Canadian magazines caused concern in the Canadian printing industry. In 1924 the *Canadian Printer and Publisher*

232. Figures calculated from statistics in: DBS, *Printing Trades, 1920*, pp. 2–3, 8–9, 14; DBS, *Printing and Publishing, 1929–1930*, pp. 1, 2, 4; DBS, *Printing and Bookbinding, 1929–1930*, pp. 1, 2, 4; DBS, *Lithographing, 1930–1931*, pp. 1–2; DBS, *Engraving, Electrotyping and Stereotyping, 1930*, pp. 1–2; DBS, *Trade Composition, 1930*, p. 1; DBS, *Printing Trades, 1940*, pp. 6–7, 16–19 ; DBS, *Printing Trades, 1950*, pp. 7, 9–11; DBS, *Printing, Publishing and Allied Industries, 1960*, pp. 11, 15–16.

233. Ibid.; H. Pearson Gundy, "The Development of Trade Book Publishing in Canada," in Ontario, *Royal Commission on Book Publishing: Background Papers* (1972), pp. 25–32.

234. Stephenson & McNaught, pp. 262–63, 266; Kesterton, pp. 69–83; Rutherford, *Making*, pp. 82–84; Fetherling, *Rise*, pp. 107–8, 112–15; *CPP* (Aug. 1918), p. 33; *CPP* (May 1947), p. 25; *CPP* (Feb. 1951), pp. 23, 42; *CPP* (Feb. 1951), pp. 52–53; *CPP* (June 1957), p. 77; *CPP* (Nov. 1957), p. 70.

235. Rutherford, *Making*, p. 82; Stephenson and McNaught, pp. 267, 276.

claimed that for every domestic magazine sold, Canadians bought five American journals. Imported duty free, while imports of raw materials for Canadian magazines were dutiable, there was "no more serious menace to Canadian publishers, Canadian business as a whole, or to the development of a real national spirit."[236] Thirty four years later the printing journal still lamented the influx of American publications, branding the new "Canadian" editions as little more than "dumping" of cheap American material already paid for by U.S. circulation. Forty per cent of magazine ad spending by Canadian corporations went to these editions.[237] But self-interest was again mixed with patriotism. The context this time was the aftermath of the Massey Commission on Canadian culture and growing concern over American international hegemony. Responding to the U.S. Postmaster General's reduction of postal rates to encourage exports of publications spreading "American ideals, culture and facts," Canadian Printer and Publisher wrote that "Canada is the prime target for this onslaught." Such efforts were being carried out as an instrument of U.S. foreign policy and regardless of the wishes of other countries and of "their efforts to retain their own national ideals and cultures."[238]

Packaging and Business Forms

Printing was performed in other manufacturing operations: for example, in the production of miscellaneous paper goods like envelopes, paper cups and plates, wallpaper and milk bottle caps or in labelling metal and plastic manufactured goods. The most notable trend in commercial printing was the emergence of a new sector where printing was performed as just one stage in a more complex processing of paper or other printable material. Work was performed not by commercial printers but by manufacturers and "paper convertors" who handled production from the raw stock to completion. Two important sectors of this new "specialty printing" field were in business forms and packaging.[239]

The forms industry owed its existence to the increasing scale and complexity of business and government operations. Commercial printers had always turned out bills, invoices, ledgers, blank legal forms and other aids to administration and record-keeping. But firms in the forms industry specialized in this field. Richardson, Bond, Wright of Owen Sound, Ontario pioneered the use of photolithography and web offset for the low-cost production of single sheet blank forms and blank books in 1918. In the 1920s it was the largest producer of such forms in Canada.[240]

But in the field of multiple copy, carbon, collated forms, production moved beyond printing to encompass more complex handling and manipulation of papers. Toronto-based Moore Business Forms was the founder of the industry. The origins of this firm date back to 1882, when Samuel J. Moore of the Grip Publishing Co. supervised production of a carbon sales book, which allowed purchaser and seller to each have a record of the transaction. So successful were these books that Moore soon went into business for himself and opened a factory in Niagara Falls, N.Y. In 1890 he purchased the Kidder Press Co., which produced a roll-fed job press that also numbered, folded and perforated, thus reducing the cost of producing the sales books by 75 per cent. The company developed other products and opened other plants in Canada and the U.S. As business machines came into more common use after World War II, Moore introduced new forms to meet a growing demand. By the late 1950s the firm employed 8500 people in 28 plants worldwide, of which 1500 worked in Canada. It produced 90 per cent of the products of the forms industry, and was the largest multiple copy forms producer in the world.[241]

Just as the forms industry answered a need created by the transformation of business and government operations, so the packaging industry responded to the transformation of product merchandising. Increasingly, consumer products were branded items produced for a national market in a few locations and distributed through

236. *CPP* (Jan. 1924), p. 35.
237. *CPP* (July 1958), pp. 137–38.
238. *CPP* (Dec. 1958), p. 39. For details on Canadian government responses to U.S. magazines, see Vipond, pp. 24–29, 60–63.
239. For an example of printing on plastic goods see *CPP* (July 1959), pp. 126–31 re. Stanley Manufacturing Co.
240. RBW, *1853–1978: 125 Years of providing opportunity for people of purpose and skill* (Owen Sound, Ont.: RBW Inc., 1978), pp. 44–47.
241. *CPP* (Dec. 1957), p. 51. For general information on business forms manufacture see: Clifford L. Helbert, ed.; *Printing Progress: A Mid-century Report* (Cincinnati: International Association of Printing House Craftsmen, 1959), pp. 380–84.

chain retailers. The chain supermarket, led by Dominion Stores and Loblaws Groceterias, became an established force in Canadian retailing in the 1920s and 1930s. In these self-service stores, which relied for their profits on high turnover and high volume of sales per employee, packaging had to not only preserve and protect the product but to attract the eye, distinguish the product from its neighbours, and encourage shoppers to buy. The increasing promotion of prepared foods by manufacturers after World War II increased the need for sophisticated packaging. As one ink manufacturer said in 1958, "when you look around in a supermarket, printing inks are mostly what you see."[242]

The packaging, or box and bag, industry enjoyed steady growth from 1930 to 1960, exceeding the rate of increase in printing during the 1930s and 1940s and almost keeping pace through the 1950s. In recognition of the growing importance of a distinctive packaging industry, a trade publication *Canadian Packaging* was issued for the first time in 1948. While some printing and lithography firms produced labels and folding boxes as their main line, other packaging firms tended to be specialists in converting particular materials, not in printing. Packagers used a variety of rigid and flexible materials: paper and cardboard, glass, metal, foil (backed with paper), waxed paper and glassine, cellophane, and polyethylene. One of the first foil printing jobs in Canada took place in 1924. The first glassine candy wrapper appeared in the United States in 1917, while cellophane was first used for printed packaging in 1924. Because of the qualities of the materials and the inks, firms made relatively frequent use of new methods like offset, rotary gravure, flexography, and screen printing. Machines were often custom built to integrate printing in the flow of production.[243]

The most important products of Canadian box makers were corrugated cartons used in shipping goods, folding boxes that were delivered from the factory in collapsed form, and rigid or "set-up" boxes such as used by jewellers and chocolate makers. Of the three, the first two involved printing directly on the raw stock before die cutting and stamping, while the latter often required a printed paper wrapper be pasted on the finished box. Most boxes were printed by letterpress or offset. The bag industry produced large quantities of "self-opening," square, paper grocery bags. By 1960 "multi-wall shipping sacks" for such commodities as flour, salt and cement were the most important products. Plastic and cellulose bags, which were an insignificant product before World War II, grew to encompass 24 per cent of all bag production (in dollars) by 1960. In the 1950s alone, consumption of polythene film increased from 200,000 pounds at the beginning of the decade to 15,000,000 pounds at the end.[244]

The wide variety of production methods used in packaging signifies the importance of several innovations in printing. So too commercial printers looked to technology like offset photolithography to maintain profitable production. Newspaper proprietors chose several technological options to enhance their profitability. Responding to competition for advertising revenue from other printed matter and from radio and television, they introduced colour units to their presses to enhance the appearance of their ads. To address increased circulations and rising costs, they demanded faster presses, cheaper engravings, and streamlined composition. These developments will be discussed in Part 2.

Part 2 – Printing Technology, 1920–1960

Printers acquired new equipment for four reasons: to replace worn-out and broken-down plant, to cut production costs by replacing functional but obsolete equipment, to expand production capacity in existing products, and to enter the market for new products. All four reasons provided the opportunity for adding new technol-

242. *CPP* (March 1929), pp. 49–57; Stephenson & McNaught, pp. 309–10. Quote in *CPP* (Jan. 1958), p. 5. For general information on the packaging industry, see Helbert, pp. 443–63.

243. *CPP* (June 1932), pp. 34–5; *CPP* (Feb. 1950), p. 37; *CPP* (April 1950), p. 25; *CPP* (Jan. 1958), pp. 81–84; *CPP* (Aug. 1958), pp. 40–42; *CPP* (Feb. 1959), p. 60; *CPP* (April 1959), pp. 68–69; Helbert, p. 459.

244. DBS, *Preliminary Report on the Paper Box and Bag Industry in Canada, 1929–1930*, Cat. No. 36-202, pp. 2, 5; DBS, *The Paper Box and Bag Industry in Canada, 1940*, Cat. No. 36-202, pp. 4, 10; DBS, *The Paper Box and Bag Industry, 1950*, Cat. No. 36-202, pp. 5, 7; DBS, *Paper Bag Manufacturers, 1960*, Cat. No. 36-207, pp. 11-13–14; DBS, *Paper Box Manufacturers, 1960*, Cat. No. 36-208, pp. 11–12, 14; *CPP* (April 1966), p. 13; *CPP* (June 1974), p. 44.

ogy, though the first two implied a less aggressive approach than the latter.

The pattern of new equipment acquisition differed in the first and second half of the period between 1920 and 1960. In the first half, heavy competition, low prices and sporadic orders dictated that printers cut costs and make their operations as efficient as possible. At the same time, however, reduced cash flow made acquisitions difficult and risky. In this period, commercial printers continued to invest in automatic presses and in new equipment to replace older machines with high maintenance and running costs. At the same time, however, printers could pick up cheap used equipment in the second-hand market, which was full of plant forfeited by failed printing firms. For these reasons, most new acquisitions were probably incremental improvements on their predecessors and not major technical departures.[245]

During World War II prosperity returned to the printing industry. But with suppliers' plants being converted to war production little new machinery was delivered during the war. Moreover, manufacturers were unable under these conditions to test product changes. After the war, press manufacturers were faced with order backlogs of up to three years. The first few years of peace, therefore, were marked by continuing equipment shortages (despite a tripling of press imports to Canada in 1946 over 1945) for printers and few major technical improvements. As late as 1954, the *Canadian Printer and Publisher* reported that much equipment in Canadian plants had been installed before the war.[246]

By this time, however, printers were in the middle of an acquisition spree as they sought to meet growing demand for their products and counter rising wages, a reduced work week and general inflation. Between 1950 and 1955 Canadian printers imported new equipment worth almost $116 million, with the value increasing every year except 1952. In 1956 *Canadian Printer and Publisher* reported that four out of five firms would buy new equipment in the next two years. Much of this equipment was technically advanced and involved new processes. Perhaps the most notable of these was offset photolithography.[247]

Printers were not only buying equipment. They were also moving into new buildings, and buildings of a new type. While historically printers had housed themselves downtown in multi-storey buildings near their clients, the new plants were usually large, one- or two-storey structures built in the suburbs where land costs were low. Access for employees was by car, for shipping and receiving by truck and sometimes rail. Press and bindery areas were housed on one level in vast, open spaces where machinery could be arranged freely for most efficient movement of raw materials and product. Straight line production, with receiving at one end and shipping at the other, was popular. One such plant, Maclean-Hunter's new plant in suburban Toronto, was proudly described as "a gigantic processing machine into which copy pours in one end, high quality printing and publishing flows out the other."[248]

Letterpress Developments

In view of the extensive discussions of new technologies that will follow it is important to emphasize that for most commercial printers and virtually all newspapers, hot-metal letterpress remained the dominant technology before 1960. Technical refinements within this field continued.

In commercial printing, the competitive 1920s saw the widespread adoption of automatic cylinder and platen presses, a process that was already underway during World War I. A 1920 survey of 200 Toronto commercial shops already found 80 machine-fed platen presses and 55 machine-fed cylinder presses operating beside 484 and 216 of their hand-fed counterparts. Unlike the first outfits, where automatic feeds were simply attached to existing models, presses by the 1920s were designed as fully automatic units. The most frequently mentioned of these

245. *CPP* (Jan. 1924), p. 68; *CPP* (Jan. 1928), p. 45; *CPP* (Jan. 1932, pp. 2, 7, 21, 32; *CPP* (Feb. 1932), p. 30. For one firm's response to keen competition and the need for new equipment, see Hunter Rose Co., Box 3, Minute Book 3, 30 Nov 1927 and Box 4, Minute Book 4, 14 June 1929 – 14 Feb 1930, Hunter Rose Papers, No. 217, Thomas Fisher Rare Book Library.

246. *CPP* (Jan. 1945), p. 42; *CPP* (Jan. 1946), p. 19, 22–23; *CPP* (April 1947), p. 43; *CPP* (April 1956), p. 49.

247. *CPP* (Jan. 1956), p. 46; *CPP* (April 1956), pp. 49–50; *CPP* (Jan. 1957), p. 124.

248. *CPP* (Jan. 1958), pp. 85–87; *CPP* (April 1958), pp. 51–52; *CPP* (May 1958), p. 75; *CPP* (Aug. 1958), p. 32; *CPP* (Sept. 1958), p. 76; quote in *CPP* (Feb. 1949), p. 28.

presses were small cylinder machines such as the Miehle Vertical, the Miller High Speed Press and the Kelly. Equipped with effective suction feeds and taking sheets up to 14 x 22 inches, they produced 2000–4000 high-quality impressions per hour. The Miehle Vertical attracted immediate attention when it was introduced to the North American industry at a print employers' convention in Toronto in 1921. From 17 Miehle Verticals in Canada in 1923, the number by 1929 had risen to 275.[249]

With these new fast presses, extension deliveries and heating units became essential to ensure that ink was fully dry before piling. Essentially bars attached across the delivery end of the press, electric or gas ink dryers became a standard feature of letterpress work. Among the ink dryers on the market by the end of the 1920s was one produced in Toronto by the Leslie Electric Co. In 1959, one dryer on the market was a gas unit produced by Rieger Printing Ink Co. of Toronto. This firm also had units built in the United States to supply American printers. In addition to dryers, printers also adopted systems that sprayed powders onto wet sheets to prevent offset, smudging and sticking.[250]

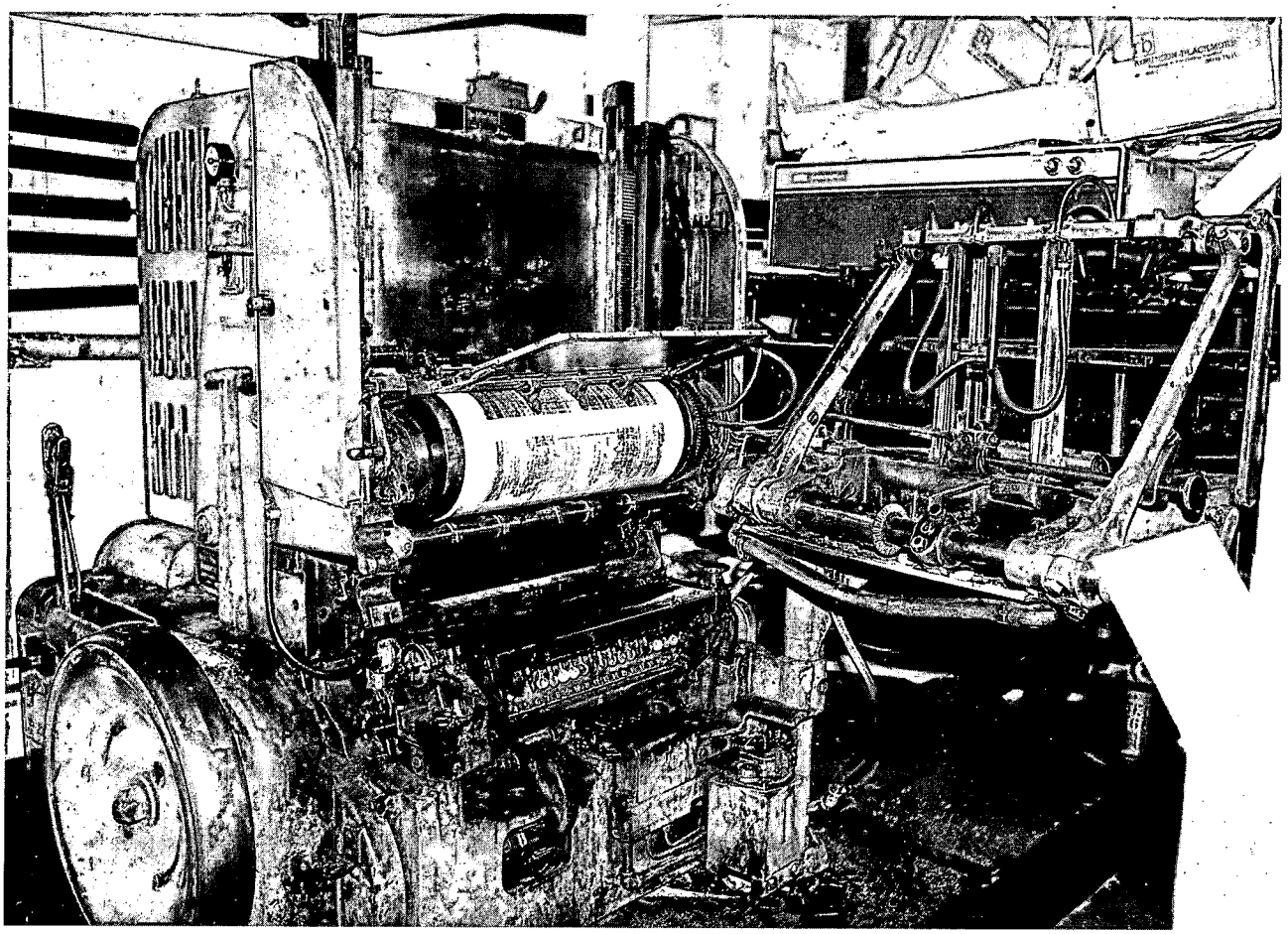
The attention to ink drying revealed a problem with faster press speeds. This problem was also addressed by the printing ink industry, which in this period was being revolutionized by the application of scientific chemistry. For centuries, the main vehicle for carrying pigment had been a varnish of boiled linseed oil and rosin, which dried by oxidation over a period that extended to days according to weather conditions. Chemists gradually learned to speed up drying time by adding metallic dryers—cobalt, manganese, soaps of lead—to the oil vehicle. Later, they amended or replaced the linseed oil with a variety of mineral oils, solvents, resins, esters, synthetic and natural rubbers and other substances. "Heat-drying" inks came into use in the 1930s. Based on a resin-solvent varnish, they dried by rapid evaporation of the solvent under the application of high temperatures. They were used on high-speed, web-fed presses fitted with heating units to print four-colour magazines, catalogues, and packaging.[251]

In the packaging field, "moisture-set inks" were similarly major departures for ink makers. These mixtures dried by "precipitation." After printing, the solvent in the ink absorbed moisture either from the paper or from applied steam, causing the pigment and resin, incompatible with water, to precipitate out onto the paper. Rapid setting, odourless, oilproof and greaseproof, moisture-set inks were ideal for food packaging, paper tissues and serviettes, brown paper bags, and corrugated cartons. Introduced around 1940, by 1950 they dominated some parts of the packaging industry.[252]

Rotary newspaper presses were also improved. By the 1920s the towering multi-deck presses were outmoded. Instead, printing couples were arranged in long, low lines of thirty or more arch-shaped units. As the height of the superstructure was lowered, inking and plate mounting was standardized at waist level. Heretofore, pressmen had been required both to duckwalk along the length of the press topping up ink reservoirs and to hoist sixty pound stereotypes over their heads to mount plates on cylinders. Automation further speeded up press work. The Cutler-Hammer newspaper conveyor (1912) quickly took away papers as they emerged from the folder. The Hoe company (1914) devised a means of automatic ink distribution by pumping it through hoses from tanks. In the 1920s, paper rolls were removed from the pressroom and fed up from the basement to the presses. Soon automatic splicing of the new web onto the end of the old was accomplished.[253]

The most significant development in newspaper presses after 1945 was improved colour capability. The invention of a portable colour fountain (1937) allowed any cylinder on a press

249. *CPP* (June 1920), p. 42; *CPP* (May 1924), pp. 47–48, 55, 64; *CPP* (Oct. 1924), p. 13; *CPP* (Feb. 1929), pp. 23; *Inland Printer* (Jan 1922), p. 527. One example of the old approach to automatic operation was Manton Bros. (Toronto) "Canadian-made High Speed Job Press," an ordinary platen machine fitted with electric motor and automatic feeder, *CPP* (May 1924), p. 57; *CPP* (June 1924), p. 59.
250. *CPP* (June 1924), p. 25; *CPP* (Feb. 1929), pp. 36, 103; *CPP* (June 1939), p. 50; *CPP* (April 1959), p. 83.
251. *American Pressman* (Feb. 1950), pp. 76–78, 114; *CPP* (Sept. 1951), pp. 27–28, 72; Helbert, pp. 291–97. For detailed, technical information on printing ink in this period, see: Herbert J. Wolfe, *The Manufacture of Printing and Lithographic Inks* (New York: MacNair-Dorland, 1933) and E.A. Apps, *Printing Ink Technology* (New York: Chemical Publishing, 1959).
252. Ibid.
253. *American Pressman* (Nov. 1965), pp. 39, 48.



Miehle Vertical small automatic cylinder press, introduced 1921.

to be converted to colour. The Goss Headliner and Hoe Streamlined Color-Convertible presses were both introduced in 1945 and marked a new stage in colour newspaper printing. These presses offered "run-of-paper" (ROP) colour, the ability to print colour in the regular print run without requiring a separate operation. This was done by attaching portable colour fountains or by adding permanent colour "decks" over some units. As well, technicians developed simplified colour separation and colour correction methods adapted to the time requirements of newspapers. In Canada in the 1950s large daily newspapers installed the new presses to meet demand for colour advertising and competition from other media. In 1956 food processor Libby, McNeill & Libby ran the first colour national newspaper ad campaign. By 1958, 81 of Canada's 107 dailies could offer some colour, up from just 30 in 1954. While certainly an advance, the print quality of most of this work was not high, especially where more than one colour was printed on a page. The most severe problems were poor register and lack of ink colour standardization.[254]

Newspapers also attempted to streamline their typesetting operations. The most important hot-metal typesetting developments were the general adoption of the Ludlow display type caster by the end of the 1920s and, in the 1950s, the adoption of the Teletypesetter for straight composition. This device, introduced in 1932 but not popular till after the war, used punched paper tape rather than direct keyboard operation to increase output on linecasting machines by 50 to 75 per cent. The perforator featured a standard typewriter keyboard that could be operated by a typist with limited typographical training. Moreover, the coded tape could be used to transmit over telecommunications lines to a distant location, where a repunched tape would automatically operate a line caster. The teletypesetter therefore not only cut costs by increasing the output of any machine, it also allowed operation of multiple machines from a central source, enabling news copy to be written and edited in a central location and automatically typeset in individual plants. Its first major use in Canada was by the Thomson newspaper chain for just this purpose. Linecaster manufacturers responded to teletypesetting by making their machines more adaptable to automation. By the end of the decade, the Intertype company was producing the Monarch, a keyboardless linecaster specifically designed for tape operation.[255]

Flexography: Rubber Plates Add Flexibility to Letterpress

After World War II a new form of letterpress plate made from rubber or synthetic rubber came into increasing use in specialized applications. Though dating to the late 19th century, before the 1930s rubber plates were limited to cheap paper bag printing on coarse stocks. Plates were either plaster-moulded or hand-cut and inks were quick-drying, fluid solutions of aniline dye, alcohol and shellac. This situation began to change in the 1930s. Paper convertors were increasingly drawn to this economical, if inelegant printing method. More importantly, the introduction of non-absorbent materials like cellophane for food packaging created the demand for new inks. Conventional letterpress inks required overnight drying, and the non-absorbent nature of cellophane, especially in its moistureproof form, caused offset and smudging on the press. Moreover, the oxidized oil from letterpress inks gave food packaging an offensive odour. Aniline inks adhered well, dried quickly and left no odours. They were, however, nearly transparent when printed on cellophane.

During the 1930s and 1940s improvements in inks, plates, and presses increased the utility of rubber plate printing. The problem of ink transparency was overcome by substituting finely ground, opaque pigments like titanium dioxide for the old aniline dyes. After the introduction of polyethylene and other plastic films, more suitable synthetic resin binders replaced shellac. Plate making was greatly improved by creating moulds from a thermoplastic resin like bakelite. This material was laid over a high-relief photoengraving, subjected to heat and pressure, and then cooled. The cost of making a plate was reduced to the same level as a stereotype. More solid press construction, meanwhile, allowed precise impression and better register. Heaters

254. *American Pressman* (Nov. 1965), p. 51; *CPP* (Mar. 1945), p. 1; *CPP* (Jan. 1946), p. 17; *CPP* (Jan. 1956), p. 46; *CPP* (April 1957), p. 57; *CPP* (July 1958), pp. 59–60; *CPP* (Nov. 1959), pp. 71, 73; Helbert, pp. 419–30.

255. *CPP* (Feb. 1929), pp. 6, 41; *CPP* (June 1929), p. 6; *CPP* (May 1951), p. 14; *CPP* (June 1951), p. 59; *CPP* (Aug. 1951), p. 38; *CPP* (Sept. 1951), pp. 52, 54; *CPP* (Nov. 1959), pp. 13, 61.

were installed to accelerate drying between colour units and because moistureproof cellophane and some plastic films would not take ink unless first heated. Finally, the quantity of ink transferred to the stock was precisely controlled by the anilox inking system, wherein the steel inking roller was surfaced in indentations of precise depth. Ink was carried in these indentations and therefore its quantity could be controlled by the depth of the recesses.[256]

Canadian packagers were not slow to adopt rubber plate printing. The method offered cheap, quick, durable plates, little make-ready (the plate was cemented to the impression cylinder), and inks suitable to a variety of stocks, from coarse paper and cardboard to foils and transparent films. By 1940 the use of rubber plates was steadily increasing. In 1947 the *Canadian Printer and Publisher* reported that "the rubber plate is rapidly coming into its own, opening up new avenues of improved technique and lower cost production."[257] Several houses in Canada were making rubber plates for printers. In the 1950s, rubber plate, or "flexography," as it was coined by industry representatives in 1952, became the "fastest growing printing method in the packaging field."[258] It was used for paper bags and boxes, cellophane, plastic and foil bags and wraps, paper cups, milk containers, and some publication work. One notable use in the United States was in the printing of cheap pocketbooks.[259]

Rotogravure

Much that could be said for flexography in packaging could also be said for the new technique of rotogravure, except that the latter surpassed it in quality and price. This technology gradually acquired a small niche in the printing industry, both in packaging and in publications. As far back as 1910 the *Canadian Printer and Publisher* had alerted printers to developments in Germany, where the graphic arts industry was buzzing with news of "a really remarkable invention of a Dr. Mertens, of the town of Freiburg." The invention was a web-fed, rotary gravure press that printed high quality illustrations for the newspaper *Freiburger Zeitung*. This was the first mention of the technology in the Canadian trade press. But the technology itself had existed for several years, though in obscurity.[260]

Intaglio was the original rotary process, but the application of the rotary principle to a power gravure press for printing on paper occurred relatively late. In 1860 Auguste Godchaux, a Paris publisher, patented a web-fed, rotary perfecting press that was used until 1940 producing school copybooks. Another was installed in Liverpool for the same purpose, but the machines did not enjoy fame. In 1895 the photogravure pioneer Karl Klic established with his colleague Samuel Fawcett the Rembrandt Intaglio Printing Co. Klic and Fawcett both worked for Storey Brothers, textile printers in Lancaster, and it is almost certain that they were inspired by the calico presses used by their employers. Klic and Fawcett began producing art prints by rotogravure, effecting an increase in production from 400 impressions a day to 5000. They kept their production process a secret. After the turn of the century several firms in Germany and the United States independently developed their own systems and also began quietly producing rotary photogravure prints. Rotogravure remained shrouded in trade secrecy until almost 1910.[261]

As might be surmised from the involvement of Klic, rotary intaglio printing was inseparable from photogravure processes of platemaking. Rotogravure depended on the application of cross-line screens to the production of cylindrical plates. Klic found that the etched grain produced by using a powdered resist, the technique of photogravure, was unsuitable for the mechanical wiper blade on the rotary press. He substituted for this a regular cellular structure produced by exposing the carbon tissue print to light through a screen before transferring it to the plate. In etching, a uniform pattern of cells was created (a similar system was independently patented by the Austrian Adolf Brandweiner in 1892). It should be noted that in this technique the function of the screen was not to approximate tonal

256. For a good summary of technical developments see: *Flexographic Technical Journal*, 25th Anniversary Issue (1983), pp. 24–25, 80–83; and the "Aniline Printing" series in *American Pressman* (Jan.–June 1950). See also: *American Pressman* (Nov. 1965), pp. 86–92; Helbert, pp. 228–29, 298.
257. *CPP* (Jan. 1947), p. 35.
258. *CPP* (Feb. 1957), p. 48.
259. *CPP* (March 1940), pp. 23, 38; *CPP* (Jan. 1947), pp. 35–36, 68; *CPP* (Feb. 1957), p. 47–49, 80; *CPP* (Nov. 1957), pp. 37–38; *CPP* (March 1959), p. 62.
260. *CPP* (Dec. 1910), p. 34.
261. Otto M. Lilien, *History of Industrial Gravure Printing up to 1920* (London: Lund Humphries, 1972), pp. 22–43, 123–27.

gradation but simply to create a means of holding ink in the etched cavities of the plate. As with photogravure, tonal variation was conveyed by the depth of each cavity, which held variable amounts of ink.[262]

The watershed year for rotary gravure was probably 1910, the year that Mertens announced his use of the technology for newspaper printing. After this it was quickly adopted in Europe and North America for the production of some illustrated magazines and catalogues, the new presses printing up to 3000 perfected impressions per hour. Rotogravure's black and white halftones were praised for their "artistic quality and photographic richness" far surpassing results achieved by letterpress. Rotogravure printers soon also learned that text, photographed from a proof taken off moveable types, could be engraved on the cylinder alongside illustrations. Observing foreign developments in 1913 the *Canadian Printer and Publisher* reported that "the triumph of the year seems to have been the rotary intaglio process, and it is now conceded to be the best method of pictorial reproduction." In 1912 the Hoe Company built the first American-made press to print the Sunday supplement of the New York *Times*. In Canada, the first rotogravure printer was Grip Ltd. in Toronto, which in 1914 began producing the Sunday edition of the Toronto *World* on a German-built, reel-fed press.[263]

William Gamble, editor of the British trade publication *Penrose Annual*, became a fervent convert to rotogravure, which not only exceeded letterpress halftone in quality but also, he claimed, was accomplished with simpler and faster presswork, cheaper paper and ink, and a lower labour cost in printing. Only the cost of engraving was higher. Through the war years he predicted it might soon supplant the letterpress printer in catalogue, book and magazine work. Rotogravure, though, had its limitations. Plates were expensive, and text had still to be set in type, proofed, and photographed before platemaking could begin. Three-colour work, moreover, was not yet perfected, the main problem apparently being that the ink of one colour was not fully dried before the paper passed to the next plate.[264]

By the end of the 1920s colour rotogravure for periodicals was moving beyond the elementary stage. New pigments were available and more volatile solvents, enclosed ink fountains, and heating units allowed faster press runs. The Montreal *Standard*, *La Presse* and the Toronto *Star* each had their own plants to produce weekend supplements. In Toronto the country's only commercial gravure plant, the Canadian Gravure Co., was purchased in 1932 by Murray Printing and Gravure and began to print American magazines for the Canadian market. Later it added the Eaton's catalogue to its production lines. But because expensive rotogravure plates were only economic on long press runs, plants were not numerous. By the late 1950s the situation was little changed from twenty years earlier. The *Canadian Printer and Publisher* reported that "the number of rotogravure plants in Canada can be counted on one hand with fingers missing." In 1957 the Toronto *Globe & Mail* was compelled to have its new supplement printed in the United States because the only Canadian plants were either owned by competitors or, in the case of Murray, ineligible because of union rules.[265]

In spite of this situation, developments in packaging materials and ink were creating a new potential for rotogravure. As noted above, the introduction of cellophane packaging posed problems for letterpress printers. Solvent-based rotogravure inks, like those used by flexographic printers, obviated these concerns. For the same reasons, gravure inks of different formulations were also useful on the various plastic films that were used with increasing frequency after World War II. Unlike flexography, however, rotogravure was capable of producing high quality halftones and fine type, though at a higher cost in plate preparation. Rotogravure tended, therefore, to be used in long-run, quality package printing. It is not known how much rotogravure was used for

262. Nadeau, pp. 418–9; C. Gamble, p. 183; Gernsheim, p. 544; Wakeman, p. 127; H. Mills Cartwright, *Photogravure: A Text Book on the Machine and Hand Printed Processes* (Boston: American Photographic Publishing, 1930), pp. xv–xvi; Lilien, pp. 29–32.

263. *Penrose Annual* (1913), p. 3; *CPP* (March 1915), p. 45; *American Pressman* (Nov. 1965), pp. 62–64; Lilien, p. 144. First quote in *Penrose Annual* (1914), p. 1; second quote in *CPP* (Feb. 1913), p. 68.

264. *Penrose Annual* (1910), p. 12; *Penrose Annual* (1912), pp. 5–6; *Penrose Annual* (1913), p. 3; *Penrose Annual* (1914), pp. 1–4; *Penrose Annual* (1915), pp. 4–5; *Penrose Annual* (1916), pp. 12–13; *Penrose Annual* (1920), p. 5; W. Gamble, p. 271.

265. *CPP* (Jan. 1929), p. 45; *CPP* (April 1932), p. 29; *CPP* (May 1936), p. 37; *CPP* (March 1956), pp. 33, 37; *CPP* (Sept 1957), p. 114; *CPP* (May 1957), p. 49; *CPP* (July 1957), p. 5; Helbert, p. 301.

packaging work in Canada. In 1960 one quarter of bag sales were cellophane or plastic, and some of this was undoubtedly done by gravure. One firm, Reynolds Aluminum of Cap-de-la-Madeleine, Que., was in 1957 printing long runs of foil packaging on three rotogravure machines.[266]

Screen Printing

The rise of flexographic and rotogravure methods was due to the increasing importance of mass merchandising and to the use of new and unusual materials in printed packaging. Both these factors were also responsible for the development of another new method based on an older one, screen or silk screen printing. This system was reminiscent of the ancient stencilling principle. In the screen process the stencil was fixed to a fabric screen mounted in a frame. Ink was forced with a squeegee through the screen in all areas not blocked by the stencil. Screen printing dates from the early 20th century, when innovators in England and the United States applied it to sign writing and production of cloth banners and pennants. In or around 1911, John Pilsworth of San Francisco devised the Selectasine process that printed several colours from one screen. Patented in 1918, it seems to have been the process on which the screen printing industry developed.[267]

Screen printing possessed certain attributes that gave it a specialized role in printing. Screen printers could use a variety of inks, paints or lacquers and lay down a thick layer on the printing surface. Screened colours, therefore, had a high degree of depth, opacity, and intensity, and light colours could even be printed over dark. Screen printing was also versatile, able to print on virtually any material or surface, including a curved one. By building a suitable frame, the method could also print any size, from a milk bottle to a two-ton truck. Finally, screen printing in its simplest form required no expensive machinery and screen preparation was simple. It was therefore well suited to short run jobs of a few hundred copies where other printing methods were not economic.[268]

As with so much other printing technology, World War II marked a watershed in the screen printing industry in Canada. Though before the war photography was used in preparing some screens and some printing machines were available, screen printing everywhere remained a hand craft, devoted to short runs on often home-made equipment. During and after the war this changed, as new markets, new machines, new inks and new drying techniques resulted in longer runs and higher speeds. References in *Canadian Printer and Publisher* in 1940 do not mention machines; a report in 1945 does. But it is not clear whether any machines were operating in Canada in 1945. Holland & Neal, then the largest exclusive silk screen house in Canada, did not begin mechanizing until 1949.[269]

During the 1950s Canadian screen printers acquired new presses of two types. The flat-bed machine was similar to the hand printing table, where a screen was hinged over a table on which the printing stock was laid. However, the actions of inking the screen, lowering the screen, pushing the squeegee and raising the screen were accomplished mechanically. While sheet feeding was generally by hand, takeoff and delivery was sometimes automatic. More advanced and faster than the flat-beds were the cylinder machines. The sheet was laid on an impression cylinder and as the cylinder revolved the screen moved forward over it, bringing the sheet and screen briefly into contact under the pressure of the squeegee. Cylinder machines sometimes had automatic feeds and generally had mechanical takeoff and delivery. A similar principle to the cylinder press was used to print on round objects like bottles, where the bottle took the place of the cylinder under the screen. Among the flat-bed presses used in Canada were the McCormick and the Reinke. Reinke also made cylinder machines, but the cylinder devices most

266. *CPP* (June 1932), pp. 34–35; *CPP* (Oct. 1951), p. 46; *CPP* (Jan. 1958), pp. 83–84; *CPP* (March 1958), p. 92; Helbert, pp. 460–61.
267. Francis Carr, *A Guide to Screen Process Printing* (London: Vista Books, 1961), pp. 13–16; J. I. Biegeleisen & E. J. Busenbark, *The Silk Screen Process* (New York: McGraw Hill, 1941), pp. 1–3.
268. Biegeleisen & Busenbark, pp. 3–5.
269. Biegeleisen & Busenbark, p. 47; *CPP* (April 1939), p. 41; *CPP* (May 1940), p. 50; *CPP* (June 1945), p. 29; *CPP* (Dec. 1956), p. 34.

frequently mentioned in Canada were made by the General Research & Supply.[270]

The fastest cylinder presses operated at speeds of 2500–3000 impressions per hour, but the limits on speed were set by the long ink drying time required before stacking. A means was required for taking off sheets and keeping them separate until they dried, a process that could take up to 24 hours. Chemists devised faster drying inks, but additional drying arrangements were still necessary. Initially, sheets were carried off manually and laid on racks. A major advance was the wicket dryer, on which sheets were hung vertically and conveyed away from the press mechanically. Most effective were jet dryers, developed in the 1950s to force heated air over the sheets as they were taken off the press.[271]

Screen printers also changed the way they prepared screens. In the 1950s hand-cut, lacquer film stencils cemented to the screen were still the backbone of the industry, especially for line work. But most large firms also had equipment to produce photographic stencils from film positives. In this process, the silk screen was either coated with sensitized material and exposed or else a special film was first exposed and developed, then adhered to the screen. The first trade supplier specializing in photo stencils opened in Toronto in 1957. Some large firms, like Display Industries Ltd. (Winnipeg and Toronto) and Hamilton Screen Print, were doing four-colour, halftone work in the 1950s. But reproduction quality remained poorer than by offset or letterpress. Only coarse-line screens could be used and each colour had to be run separately and dried before the next colour run.[272]

Few silk screen plants existed in Canada before World War II. Those that did generally made signs, banners, and point-of-sale displays in stores. During the war, silk screeners printed radio and instrument dials and decals (the average bomber required one thousand decals). One innovation of the war years was the screen printing of electronic circuits, which were produced by laying down a circuit in metallic ink or by coating a thin copper sheet with acid resistant ink and etching away unwanted portions. The stimulus of the war and the post-war boom encouraged more screen shops to open. The Canadian chapter of the Screen Process Printing Association, International was established in 1950. In the 1950s screen printers insisted that thanks to new technology and expanding demand theirs was no longer a craft but an industry. From a handful of firms in 1940, the industry had grown to hundreds, some of which were large, trade manufacturers specializing in large jobs. In addition to signs, posters and decals, the industry produced greeting cards, bumper stickers, boxes and cartons, and direct mail items. Screen printing could also be used on textiles, wood, wallpaper, metal, and on cylindrical objects like bottles and jars. It is not known how much of this occurred in Canada. It is known that a subsidiary of Display Industries produced inflated vinyl toys.[273]

Offset Lithographic Press

In the early years of the twentieth century, the lithography industry was in decline, the victim of technological innovation in letterpress. Lithography was known as a secretive and technologically conservative trade. The process had seen its heyday in the 1880s, when it was the premier method of cheaply producing illustrated, colour materials. In Canada, chromolithography was used extensively for everything from calendars to security certificates to salmon can labels to dramatic renderings of "The Battle of Batoche." But the rapid introduction of zinc etching and halftone processes in the 1890s gave letterpress printers a means of duplicating or surpassing many of the effects achieved by lithographic artists. On top of this, efficient cylinder presses could turn out this work more quickly than by lithography presses. The Montreal lithography industry in particular was devastated during the 1890s by a series of bankruptcies and distress mergers. Within a few years, however, the conjunction of photography and the offset

270. Carr, pp. 99–100; Victor Strauss, *The Printing Industry: An Introduction to its Many Branches, Processes and Products* (Washington: Printing Industries of America, 1967), pp. 304, 522–23; *CPP* (Dec. 1956), p. 34; *CPP* (April 1957), p. 88; *CPP* (May 1957), pp. 54–55; *CPP* (Dec. 1957), pp. 40–41; *CPP* (May 1958), pp. 66–67; 105, 106.

271. *CPP* (May 1956), p. 38; *CPP* (May 1959), pp. 71, 90.

272. *CPP* (May 1956), p. 38; *CPP* (Dec. 1956), pp. 31, 34–35; *CPP* (May 1957), pp. 54–55, 58; *CPP* (Oct. 1957), pp. 75, 88; *CPP* (Dec. 1957), pp. 40–41, 78; *CPP* (May 1958), pp. 66–7, 105–6.

273. *CPP* (Jan. 1956), p. 98; *CPP* (May 1956), pp. 37, 39–44; *CPP* (Dec. 1956), pp. 30–31, 34–35, 56.

press revolutionized the lithography industry and revived its commercial fortunes.[274]

Rotary printing was first applied to lithography before the turn of the century. Rotary lithographic presses, first introduced in the early 1890s, employed flexible zinc or aluminum plates wrapped around the plate cylinder. The direct rotary presses were much faster than the old flat-bed lithographic machines, and several press manufacturers introduced them. But the printed product of these machines was inferior to the older process and the direct rotary press turned out to be only a transition to the technology that dominated 20th century lithography—offset.[275]

If a press-feeder missed feeding a sheet through a rotary lithographic press, the inked plate cylinder would print onto the rubber blanket of the impression cylinder. On the next impression the impression cylinder would transfer the image to the back of the printed sheet.[276] American paper manufacturer Ira Rubel noticed that the "offset" image from the impression blanket was superior to that printed directly from the plate. This was because the flexible rubber blanket could make a more uniform contact with the rough, uneven surface of the printing paper. In 1904 Rubel and two partners had the Potter Printing Press Company build three presses that employed the offset principle. In 1906 Rubel took his process to England for further development. Rubel had failed to obtain patents on his invention and that same year in the United States the Harris Automatic Press Co. introduced an offset press. The potential of offset appeared so great that press builders in the United States, England, and on the Continent quickly brought out their own offset machines. By 1910 seven manufacturers in the United States and six in Europe were building presses.[277]

Offset presses possessed several advantages that attracted lithographers and worried letterpress printers. The use of rotary offset greatly increased the rate of output. Most sizes of Hoe's traditional cylinder lithographic press could produce no more than 500 to 1000 impressions per hour. Offset machines could turn out anywhere from 2500 to 5000. One American printer, for example, estimated that a stone press could average no more than 740 impressions per hour, while an offset press in his shop easily turned out 2700. At this rate, lithography became competitive with two-revolution letterpress machines. Moreover, the rubber impression cylinder on offset presses allowed coarse papers to be used for relatively high-standard pictorial and colour work. Letterpress, on the other hand, required highly glazed, and to some eyes unattractive, papers in order to adequately render halftones and colour. Offset presses also were claimed to require little make-ready, and plate preparation by transfer method took much less time and expense than photoengraving. Offset machines could also, finally, do typographic printing by either photographing or inking letterpress proofs for transfer to the lithographic plate.[278]

Offset printing began with much promise; 700 presses were installed around the world between 1909 and 1914. Offset press builders advertised extensively in Canada and aimed their promotions not merely at lithographers but at letterpress printers. The *Canadian Printer and Publisher* reported that not only lithographers were using offset, but "many printers are installing this style of press." In addition to the usual commercial fare, it recommended the process for illustrated supplements, magazines, and catalogues. Stephen Horgan, a man who did much to popularize letterpress halftone photoengraving, warned printers that "lithographic companies are quietly absorbing much of our business." "It is time," he argued, "that we prepared

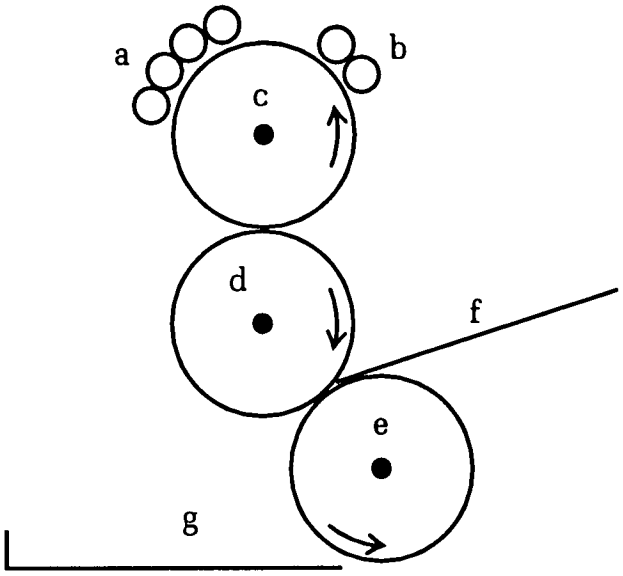
274. *Books & Notions* (June 1885), p. 175; *Books & Notions* (Oct. 1893), p. 20; *CPP* (Dec. 1892), pp. 14–15; *CPP* (Aug. 1893), p. 7; *CPP* (Dec. 1893), p. 21; *CPP* (May 1892), p. 2; *CPP* (April 1895), p. 9; *CPP* (May 1896), p. 5; *Inland Printer* (Feb. 1909), p. 702.

275. *Penrose Annual* (1905), pp. 44–46; *Inland Printer* (Feb. 1909), p. 702.

276. Offset had been used in tin printing since the 1870s because printing direct from a stone or metal plate to a tin sheet was impossible. Why it was not sooner applied to lithography on paper is a mystery. In 1901 the Toronto Lithographing Co. began making tin cans and lithographing directly onto them. It also announced plans to make tin signs. It is possible, however, that the company used the older transfer process rather than offset: *CPP* (April 1901), p. 1. For more information on tin printing see Alec Davis, *Package & Print: The Development of Container and Label Design* (London: Faber & Faber, 1967), pp. 73–74.

277. *Inland Printer* (Jan. 1925), p. 539; *Inland Printer* (June 1910), p. 386; *Inland Printer* (Jan. 1926), p. 761; Comparato, pp. 692–93.

278. *CPP* (July 1915), p. 15; *Penrose Annual* (1910), pp. 177–79; *Inland Printer* (June 1910), pp. 387, 389; *Inland Printer* (Aug. 1913), pp. 747–48; *Inland Printer* (Feb. 1925), p. 753.



a – Ink Rollers
b – Water Rollers
c – Plate Cylinder
d – Rubber Blanket Cylinder
e – Impression Cylinder
f – Feed
g – Delivery

Principles of the offset lithographic press.
(NMST)

to handle this business ourselves." These were the first signs of a convergence between the letterpress and lithography industries that would become more pronounced in later decades.[279]

Developments in Photolithography

The rapid adoption of the offset press provided the lithographers with a means of producing their products at a rate rivalling letterpress. This revived interest in photomechanical methods because until the development of a rapid press, there had been little point in searching for a cheap and expeditious means of creating a printing plate. While photography had been used to some extent for line work like maps and plans and especially work involving reducing and enlarging, the great obstacle in the first decade of the 20th century was halftone.

At the beginning of World War I lithographers were employing two means of making photographic halftone plates. Some used the established transfer process, where the printing image was laid onto the plate from an inked transfer paper that carried a photographically screened image or an impression taken off a halftone relief or photogravure plate. Others photographed directly onto sensitized stone or metal. In this case, halftone dots were created by interposing a screen between the negative and the plate or stone. Both methods could be adapted for either monochrome or three-colour work.

Only slowly did any technical uniformity evolve in the industry. The transfer method received early attention because of the entrenched practice of using transfers, the availability by 1909 of prepared photo-litho transfer paper, and the relative ease of transferring numerous small images to a single plate. Even where images were photographed directly onto stone or metal, they were often then transferred to paper, and then retransferred onto the final plate. The transfer method was used well into the 1920s. Its main disadvantages were that it was slow and labour intensive and, where transfers were taken from a halftone relief block, that it tended to squash dots and slur images.[280]

The direct-to-plate process overcame these problems, but its main drawback was the difficulty in laying down and registering multiple images or colour separations from separate negatives. This was overcome by the "step-and-repeat" process, where elaborate equipment ensured accurate register of the camera over any area on the plate. Among the pioneers in this field was the American inventor William C. Huebner. In 1912 Stone Ltd., the Toronto lithographic house, installed Huebner's first photomechanical lithographic platemaking system after American and British lithographers failed to show any interest. Under various trade names—Huebner-Bleistein, Directoplate, Ogden, and Wesel-Bassist—step-and-repeat systems gradually made their way into other lithographing establishments. By 1916, according to *Penrose Annual*, Canadian and American firms shared an enthusiasm for the Huebner-Bleistein process. In 1923 Bulman Brothers of Winnipeg installed the first direct-to-plate system in Western Canada. Two years later an American expert wrote that "it will not be long before the entire lithographic trade will be following these practices."[281]

By 1920 large lithographic firms were finding that "a photo-process plant on the premises is almost indispensable." Progress had been especially rapid in Canada and the United States. But in its early years offset photolithography failed to fully deliver on its promise. No means of transferring type to the plate produced results as bold and sharp as with real type. As well, experts still found printed pictures inferior to those achieved by relief block or photogravure. After an initial flurry of excitement at its potential, they later pronounced the work "fuzzy," "mealy," "dirty," and "flat." Though improvements were already evident by 1920, it would take decades to work out these problems, generally attributed to lack of ink intensity and problems in printing, notably poor register, damping difficulty, and

279. *CPP* (Dec. 1915), p. 55; *CPP* (July 1915), p. 15; *Inland Printer* (Aug. 1913), pp. 747–48.

280. *Penrose Annual* (1907), p. xvi; *Penrose Annual* (1909), pp. 4, 172–73; *Penrose Annual* (1914), p. 94–95; *Penrose Annual* (1916), pp. 34–35; *Inland Printer* (July 1910), p. 586; *Inland Printer* (Nov. 1925), p. 265–66. A brief, clear description of the transfer method may be found in Pankow, pp. 28–29.

281. *CPP* (June 1949), pp. 40, 50; *Penrose Annual* (1915), p. 8; *Penrose Annual* (1916), p. 14; *Inland Printer* (1925) pp. 265–67, quote on p. 265.

inferior rubber blankets. Another problem was simple inexperience and lithographers' and process workers' initial failure to recognize the difficulty in adapting photoprocesses designed for letterpress to the entirely different requirements of lithography. These drawbacks were only slowly resolved through the joint efforts of ink and paper makers, press builders, and craftsmen and chemists in the lithographic industry.[282]

Offset Photolithography Grows

Photographic platemaking was in extensive use by 1920, and by the 1930s had superseded the transfer system for much work. The ability to make perfect halftone plates with much greater ease than with transfers was a boon to lithography. In addition, photolithography provided a much cheaper means of reproduction for simple matter than available to letterpress printers by photoengraving. And in certain classes of commercial work like cannery and brewery labels, the step-and-repeat machine's ability to make from one negative "ganged" plates of perfect duplicate images gave offset lithography a decided cost advantage over letterpress, which required photoengraving, electrotyping, and elaborate make-ready to accomplish the same end.[283]

Thanks to extensive technical improvements in all aspects, lithography gradually became a potent rival for letterpress printing. Press operators, for one, acquired the necessary skills to achieve the delicate balance of chemistry and humidity required for good reproduction. The replacement of leather rollers by cold-vulcanized vegetable oil rollers, invented in 1917, allowed for more reliable inking and wider press widths. This was later followed by the synthetic rubber roller. Largely at the instigation of the Lithographic Technical Foundation, established in 1924 by the American lithographing industry, the choice and quality of papers, inks, and plates, were also improved.[284]

Unlike other printers, lithographers required papers that were water resistant and chemically non-reactive. In the 1930s research produced the first two-sided coated offset papers that met these requirements. In the post-war period, improved coated papers allowed lithographers to produce precise, brilliant halftones and thus compete with letterpress printers for high quality commercial work. Ink makers, meanwhile, developed stronger pigments to counter the thinner ink application that gave early offset its flat, washed-out appearance. Old mineral-based pigments were replaced by coal tar and organic pigments of higher intensity and less reactivity. Makers also introduced glossy inks that obviated the additional varnishing stage on certain commercial jobs. As well, ink makers made vehicle improvements similar to letterpress to produce fast drying and heat-set inks suited to fast presses and non-absorbent coated papers. One of the most important developments for long run offset printing was the introduction from Europe about 1930 of the deep etch plate, which improved durability over the flat, albumen plate. By 1958 about one quarter of offset printing in North America was done on deep etch plates. Even more durable were the various "bi-metal" plates, which usually featured a copper coating laid on the image area of the plate. These were especially valued for packaging work.[285]

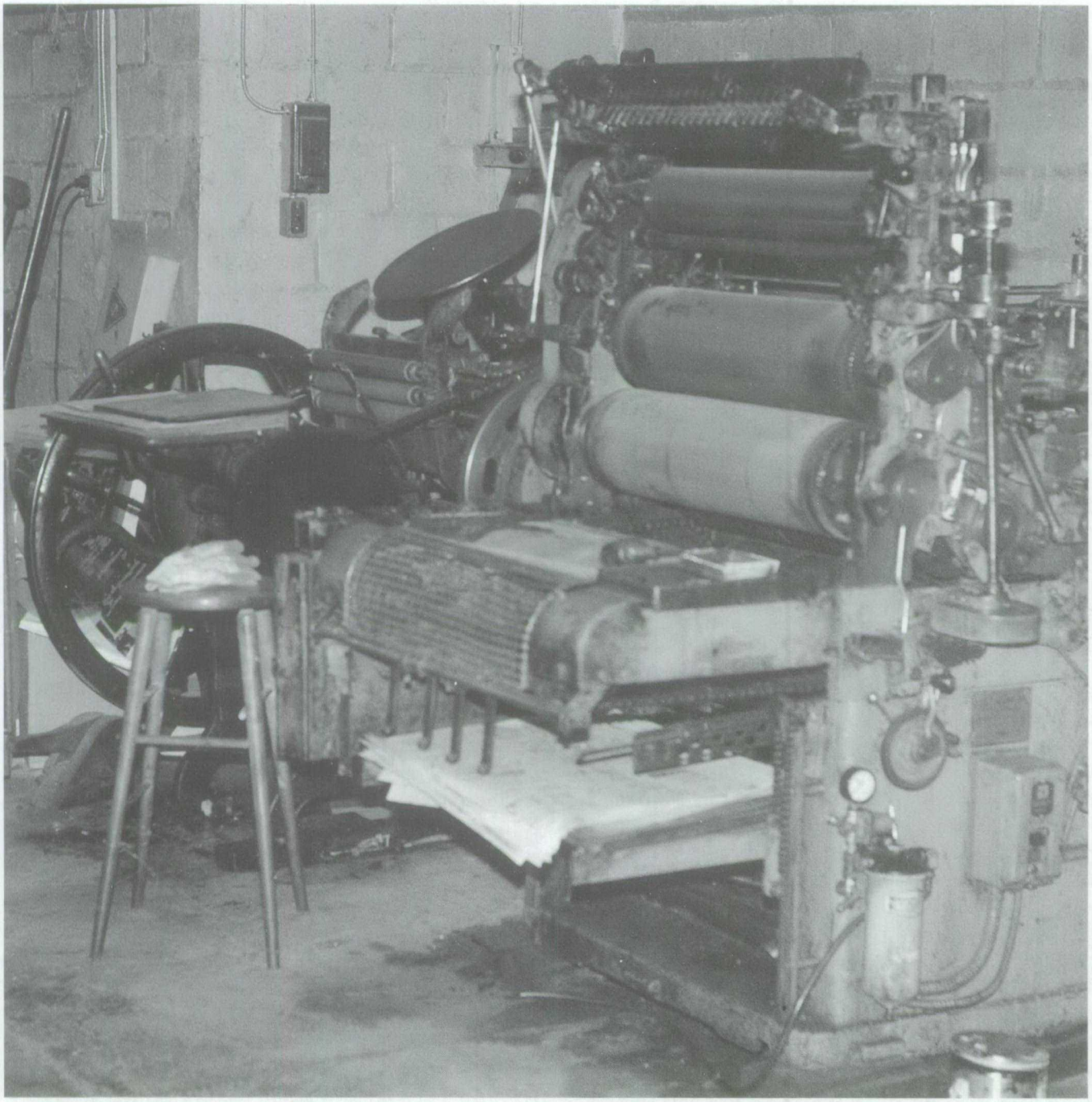
Press builders also went to work, producing a variety of machines suited to differing requirements. At the low end of the market were small offset duplicators that printed letter-size sheets. The first of these, the German-built Rotaprint and the American Multilith, were introduced before World War II. They were followed by the Davidson, A. B. Dick and other machines during and after the war. Offset duplicators were intended for use by operators without lithographic skill. More sophisticated than the Rotaprints and Multiliths were the single-colour offset presses that took sheets 17 x 22 inches and larger. These were also introduced in the 1930s. Among the most important were the Webendorfer machines, renamed Chiefs after that firm was purchased by American Type Founders in 1938. Finally, there were the large two-colour and multi-colour presses. The first two-colour press was intro-

282. *Penrose Annual* (1920), pp. 2–3, 6 (quote on p. 3); *Penrose Annual* (1911), pp. 4–5; *Penrose Annual* (1912); p. 7; *Penrose Annual* (1913), p. 2; *Inland Printer* (Feb. 1909), p. 704; *Inland Printer* (Feb. 1925), p. 753.

283. *CPP* (Sept. 1931), p. 39; *CPP* (Feb. 1945), p. 38; Fred C. Munson, *Labor Relations in the Lithographic Industry* (Cambridge, MA: Harvard University Press, 1963), p. 40.

284. *American Pressman* (Nov. 1965), pp. 76,82.

285. Amalgamated Lithographers of America, *75 Years of Lithography*, supplement to *Lithographer's Journal* (Sept. 1957), pp. 21, 26–30, 63, 74–76; *CPP* (March 1945), p. 53; *CPP* (Feb. 1958), pp. 50, 89; *CPP* (June 1960), pp. 69–70.



Two generations of job press: Westman & Baker platen job press (left), ATF Chief offset press (right). Shing Wah Daily News, *Toronto, 1979. (NMST)*

duced by Harris in 1921. Ten years later Harris introduced the first four-colour press.[286]

Most offset work was produced on sheet-fed machines in the period before 1960; the development of web offset machines lagged. High in initial cost and restricted to high-volume work, web offset was often custom-designed and used for specialized applications like business forms printing. Richardson, Bond & Wright of Owen Sound installed the world's first around 1918, a small, custom-built model for printing forms. Walter H. Smith, one of the designers of the original Harris offset, came to Toronto in 1928 to build narrow-web offset presses for forms printing. One of his offset jobbers was in the 1940s manufactured on a larger scale, by Offset Press Manufacturing Ltd. in Toronto and by Hoe in the United States. In the 1930s Webendorfer and later Hoe introduced multi-unit web-fed presses that were the forerunners of later publication presses. But widespread use of web machines for magazine and newspaper printing did not occur until the 1960s.[287]

So by the end of the 1930s many of the important requirements for the wider application of offset lithography were in place. After World War II offset advanced in two directions. On the one hand, lithographic firms expanded their business in traditional areas of strength, four-colour work in calendars, greeting cards, posters and other advertising matter, and in label and carton printing. These firms, like Rolph-Clark-Stone (Toronto), Reid Press (Hamilton), Lawson & Jones (various centres), and Bulman Brothers (Winnipeg and Vancouver), were the purchasers of large two-colour and four-colour presses. Manufacturers also used offset in such specialized applications as the decoration of metal cans and squeezable tubes.[288]

More remarkable though, was the growing invasion of offset into commercial printing markets where letterpress had long been the mainstay. This process began before World War II, when some printers began to take advantage of photolithography and small offset presses to produce cheap, quick, simple, commercial reproduction work, usually in one colour. One of the pioneers in this field was Richardson, Bond & Wright. In 1927 it introduced its "Photo-Repro" service, which featured the low-cost reproduction of typewritten and previously printed matter as well as engineering and other line drawings and halftone illustrations. Complicated statistical tables and financial statements could be cheaply set up on typewriter before photographing, rather than being typeset and run through a proof press. Corrections and amendments were inexpensive, allowing for updating of advertising matter. Marketed across Canada, "Photo-Repro" was used for letters, forms, charts and diagrams, reproductions of clippings, and other reproduction work.[289]

During the 1930s, cheap photolithography—sometimes called "planography" to distinguish it from higher class offset work—came to the attention of the printing industry as a whole. Offset duplicators like the Rotaprint and Multilith were becoming available in Canada. Rotaprint opened service centres in Toronto, Ottawa, and Montreal to produce plates for customers, so that companies could use their machines without investing in photographic facilities. In Alberta in 1939, country printers complained of business lost when municipal councils and other local boards took to printing their financial statements from typewritten originals on duplicators. After World War II, offset duplicators were sold in increasing numbers to companies who set up their own "captive plants" where office workers with no print training produced work once sent out to commercial printers or never printed at all.[290] In 1959, printers attending an industry function in Toronto were admonished:

> *... if some boy or girl in an office could run this pesky thing called offset, why then would it not be practical for a printer with all his skill and knowledge to do the same and even better. Yet ... we have in great part*

286. Helbert, pp. 475–80; ALA, p. 63; *American Pressman* (Nov. 1965), pp. 72–76.
287. *CPP* (June 1959), pp. 62, 72; ALA, pp. 64–65; *American Pressman* (Nov. 1965), p. 82; RBW, *1853–1978*, p. 44; *CPP* (March 1947), pp. 52, 56. For an example of a custom-built web offset machine see the report on Dominion Loose Leaf Co. in *CPP* (June 1951), pp. 38–39, 44.
288. *CPP* (Nov. 1951), p. 50; *CPP* (April 1958), pp. 66, 80; *CPP* (Aug 1958), p. 50; *CPP* (April 1959), p. 68. For offset on metal cans and tubes see: *CPP* (April 1950), p. 25; *CPP* (Feb 1959), p. 60; *CPP* (June 1960), p. 69.
289. RBW, *1853–1978*, pp. 53–57, 77.
290. *CPP* (May 1932), pp. 27–28, 30; *CPP* (June 1932), pp. 38–39; *CPP* (Jan 1939), p. 59; *CPP* (March 1939), p. 30; *CPP* (May 1940), p. 1. For a detailed report on offset duplicators see *CPP* (Nov. 1956), pp. 48–56.

been forced into something which has long since proven to be very good and profitable for us."[291]

In fact, letterpress printers were taking an increasing interest in offset. In the 1950s fewer than half of duplicator sales were going to captive plants. For a minimal investment and little worker training, letterpress printers were acquiring an offset capability. By 1958, *Canadian Printer and Publisher* told subscribers that "a printer without a small offset press is like a trucker without a small pick-up truck. Neither can bid—competitively—on profitable small jobs."[292]

Still more significant in the long run than the small duplicators were the one-colour presses 17 x 22 and larger. While requiring a press operator with some skill, these machines turned out better quality commercial work like letterheads, cheques, and direct mail jobs but still at a lower cost than by letterpress. Letterpress printers began setting up offset departments in the 1930s. In 1934 Hignell Printing Ltd. of Winnipeg purchased a 17 x 22 Harris press and a platemaking camera. In 1939 the Saturday Night Press of Toronto installed a Miehle one-colour offset press, a camera, and plate preparation equipment. That same year, Brigden's installed their second offset press in Toronto. In Oshawa, meanwhile, Alger Press acquired two small one-colour Mann presses. Alger did a good business turning out catalogues, parts manuals and direct mail sheets for the nearby General Motors plant and for Toronto clients.[293]

During the war, offset plants shared generous government contracts to print maps, manuals, booklets and other materials for the war effort. Interest in offset was building. In November 1944 the *Canadian Printer and Publisher* introduced a regular Offset Lithography section and reported that "a huge amount of offset equipment is now on order for use in this country," much of it by letterpress plants. By 1950 Toronto shops were scouring Europe to find skilled lithographers for new and expanded operations.[294]

In the ensuing decade offset use skyrocketed. In the face of inflation and rising labour costs, offset offered commercial printers lower make-up and plate costs, less make-ready time, and profitability on short runs. At the beginning of 1956 the *Canadian Printer and Publisher* commented that "advances in lithography have boomed this branch of the industry from the 'poor relation' of two decades ago to a strong contender for an increasing share of over-all business." Already, 29 per cent of firms it surveyed were "combination plants" doing both letterpress and offset work. Almost one quarter of letterpress-only firms planned to install offset plants in the next two years. By the end of the decade print suppliers reported that sales of offset equipment surpassed all others.[295]

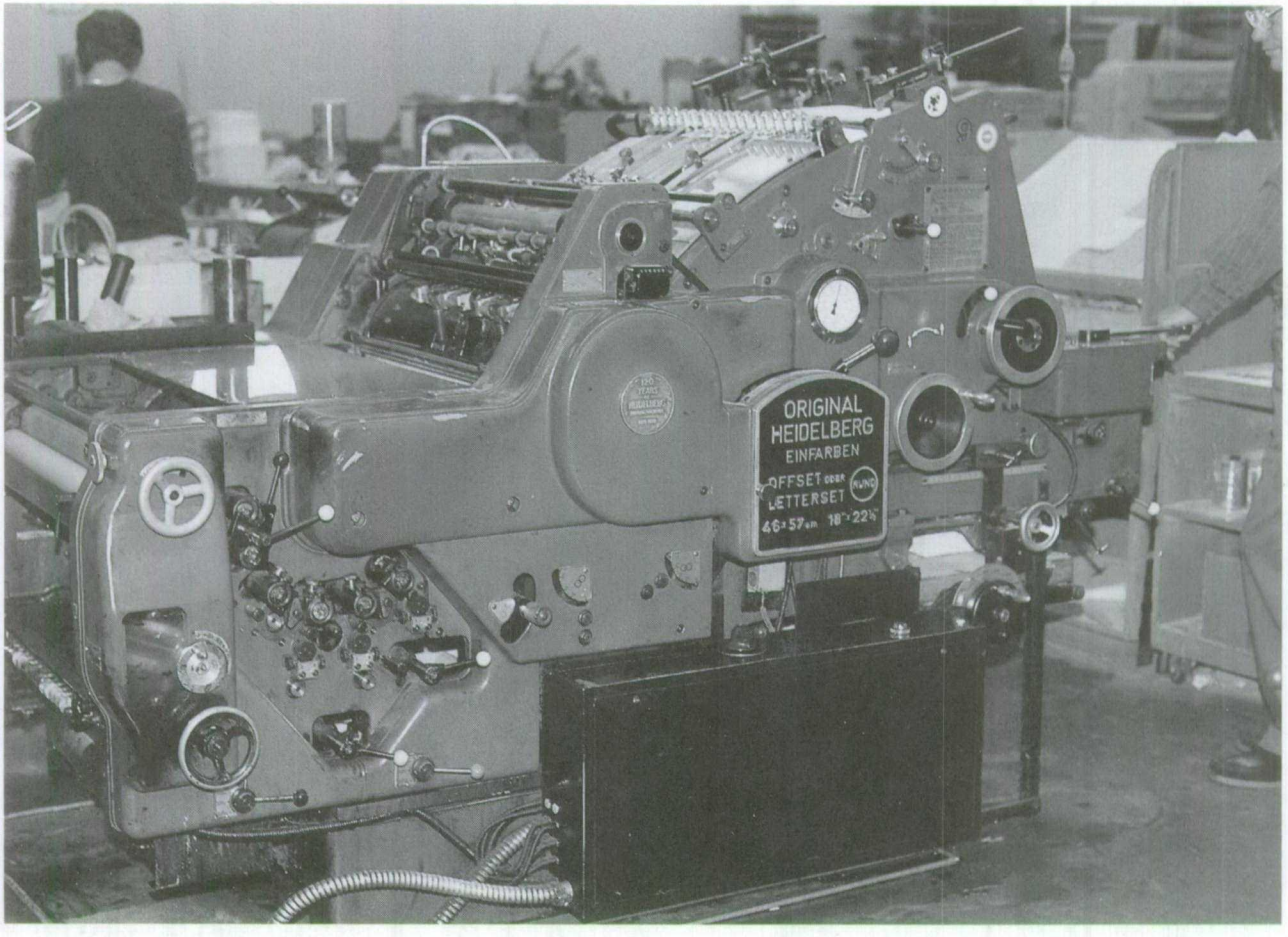
Despite the great gains made by offset, chiefly due to its cost performance, letterpress was still dominant at the beginning of the 1960s. While printers and clients preferred offset in certain aspects of commercial printing, throughout North America 90 per cent of newspapers and magazines, 85 per cent of books, and slightly smaller shares of direct mail and packaging were still produced by letterpress.[296]

Typesetting for Offset Photolithography

One key weakness of offset, especially for books and publications where text was more important than images, was the high cost and low quality of composition. Text for a printed page was produced by hot metal methods, printed on a reproduction proof press, photographed, composed into pages by one of several methods and then transferred to the photosensitized plate. Depending on the method of page make-up a further photograph might even be made before plate-making. On the press the inked plate printed onto a resilient blanket cylinder which then transferred the image, finally, to the paper. The typographical results of this involved process, especially for types with fine lines and serifs, were too often fuzzy and distorted. Letterpress printers, on the other hand, set their text by hot metal or cold metal and then printed either directly from the type form or from a stereotype.

For decades lithographers awaited a new method of composition. As early as 1877 George

291. *CPP* (Dec. 1959), p. 58.
292. *CPP* (Nov. 1956), p. 50. Quote in *CPP* (Dec. 1958), p. 49. By the end of the 1950s, the Addressograph-Multigraph Co. was assembling Multiliths in Canada at its factory in East York: *CPP* (Feb 1959), p. 67.
293. *CPP* (Feb. 1939), p. 35; *CPP* (Jan. 1940), p. 24; *CPP* (Oct. 1959), p. 96.
294. *CPP* (Nov. 1944), p. 37; *CPP* (Jan. 1945), p. 37; *CPP* (July 1950), p. 37.
295. *CPP* (Jan. 1956), p. 46; *CPP* (April 1956), p. 51; *CPP* (July 1959), p. 63; *CPP* (Dec. 1959), pp. 58, 74.
296. *CPP* (Dec. 1959), pp. 57–58.



Heidelberg single-colour offset press (sheet-fed), Dicks & Co., St. John's, Newfoundland, 1986. (NMST)

P. Drummond of Ottawa had patented a typewriter process for placing letters on a sheet to be photographed and reproduced by photolithography. He demonstrated this system at the Paris Exposition of 1878. The typewriter avenue was pursued in the 20th century, first and most successfully by the makers of the VariTyper. This machine evolved from the Hammond typewriter, which in the 1910s was adapted to handle a variety of type sizes and styles. In order to produce acceptable typography, typewriters had to be equipped with fonts that resembled those used in the graphic arts. These fonts also had to be exchangeable, to allow the mixing of bold, italic, and different sizes and styles within a text. Finally, the machines had to be equipped with proportional spacing, to accommodate variable letter widths, and with a method for righthand justification. Under the ownership of the Coxhead company, the VariTyper was equipped in 1936 with automatic line justification and in 1947 with proportionally spaced characters. VariTyper was purchased by Addressograph-Multigraph Corp. in 1956, which supplied the machines as useful adjuncts to their offset duplicators.[297]

Like the small offset machines, VariTypers found extensive use in Canadian offices and captive plants after World War II. For example, the Government Printing Bureau in 1959 was using a battery of VariTypers to set departmental publications. Also in the late 1950s, some small weekly newspapers were using VariTypers and IBM Executive electric typewriters to set copy for offset printing. Another electric machine then available was the Coxhead DSJ. The justification system on these machines consisted of a mechanical counter that, after a line was typed, indicated the number of space units remaining to justify the margin. Using a mechanical calculator on the keyboard, the operator could divide these units by the number of word spaces in the line. On some machines the calculation was done automatically and displayed on an indicator. Setting the spacing mechanism at the resulting number, the operator then retyped the line with the adjusted word spacing. The need for a second typing certainly lowered the productivity of these systems. But because the machines were much cheaper and more compact than linecasters and produced camera-ready copy, these were not drawbacks in many applications. In addition, VariTypers and other typewriters did not require well-paid, skilled compositors for their operation. Female typists were often employed as operators. Newspaper publishers, like those in Winnipeg in 1945, learned they could use typists to set type during compositors' strikes.[298]

The typographical results of VariTypers and their ilk were certainly improvements over typewriters, but they were insufficient for quality work in the graphic arts industry. Far more promising, though a long time coming, were systems that produced a negative or positive image directly from photographic masters, eliminating type altogether. Photolettering machines for display composition were introduced in large numbers in the 1950s. These were generally simple, inexpensive machines that carried font masters in the form of negatives on film bands, discs, or plates. The operator selected characters by turning a knob or spool and exposed them one by one by pressing a button to light a flash. The output was usually a continuous ribbon of paper or film that was cut and trimmed for manual paste-up or stripping. Small enough to sit on a table, these machines had a large selection of display types and could produce them in many sizes, often through the use of enlarging and reducing lenses. Among the more well-known devices by the late 1950s were the VariTyper Headliner, Filmotype, Typro, and Coxhead Liner.[299]

The setting of body type required more complex machines. In 1920 the editor of *Penrose Annual* mused about the prospects for "text being prepared with a sort of photographic linotype machine." Several inventors worked on such machines during the interwar years, but the first viable machine for body type was not put on sale until 1950. This was the Intertype Fotosetter. Patterned after a linecaster, the Fotosetter

297. *PM* (Feb. 1878), p. 188; *Inland Printer* (May 1916), pp. 247–48; Moran, *Composition*, pp. 19–20, 68; Janet N. Field, ed. *Graphic Arts Manual* (New York: Arno/Musarts, 1980), pp. 206–8; Strauss, p. 97; Wallis, *Concise*, pp. 19, 21, 24, 56, 70.

298. *CPP* (June 1945), p. 36; *CPP* (Feb. 1950), p. 22; *CPP* (Feb. 1957), pp. 54–55; *CPP* (Sept. 1957), p. 72; *CPP* (June 1958), pp. 72, 78; *CPP* (Jan. 1959), p. 71; *CPP* (Oct. 1960), pp. 65–68; *CPP* (Nov. 1963), pp. 53–54; Zerker, p. 232. For the use of female typists, see the photograph in *CPP* (Jan. 1959), p. 71 and the VariTyper ad in *CPP* (March 1963), p. 39.

299. *CPP* (Sept. 1957), p. 72; *CPP* (April 1959), p. 58; Strauss, pp. 95–96.

assembled lines of circulating brass matrices with photographic negatives embedded in their sides. In place of the casting box was a photographic unit that reproduced the line of type on photosensitive paper. Similar adaptations of hot metal methods were the Rotophoto and the Monophoto, both photographic versions of the Monotype introduced in 1949 and 1956. The first Fotosetter in Canada went into operation at the Toronto trade typesetter Cooper & Beatty in 1951. By 1960 the Toronto Type Foundry estimated there were three times as many Fotosetters in use as all other keyboard operated phototypesetters. But by 1960 other machines that did not rely on the complex mechanics of the hot metal machines were coming to the fore. These "second-generation" phototypesetters dominated the field in the 1960s and will be discussed in the next chapter.[300]

Technology and the Trade Unions

Among compositors, the technological situation between 1920 and 1960 was relatively stable. This was reflected in their relations with employers, which were by no means pacific but which generally revolved around questions of wages and working hours and the closed shop, rather than technology as such. In the 1950s, the International Typographical Union successfully exerted control over teletypesetters in union shops. While these machines speeded up some operations, they did not greatly alter other aspects of the labour process, where traditional typographical skills were still required. Phototypesetters were not yet a large presence in the composing room in 1960, and difficulties regarding them were just beginning. Yet, an indication that the strong position of the compositors might soon change occurred as early as 1945, when the ITU lost a protracted strike at several large Canadian daily newspapers. According to one historian of the union, the ITU failed to appreciate the ability of newspapers to use alternative technology and to utilize other craft unions to publish without compositors. In Winnipeg, for example, the newspaper owners printed a joint edition by having news copy typed and engraved. This vulnerability of the compositors would be more fully revealed in the 1960s.[301]

Printing presswork was much more subject than composition to ongoing technological change. The adoption of high speed automatic cylinder presses in commercial shops in the 1910s and 1920s gradually eliminated the jobs of semi-skilled pressfeeders, but this does not seem to have occasioned mass unemployment. While low-skilled job opportunities in the pressroom diminished, the piecemeal introduction of new machines and the typically high turnover among press feeders allowed most staff reductions to be made by attrition. Many remaining feeders were given jobs as general press assistants, especially in union shops. Over time, lower unit costs stimulated demand for commercial printing and actually increased the need for skilled pressmen.[302]

In response to the proliferation of new printing processes, the International Printing Pressmen's and Assistants' Union attempted to extend its jurisdiction into the pressrooms of offset lithographers, rotary gravure printers, and packaging, business forms and other specialty printers. This led to inter-union conflict, especially with the offset pressmen, many of whom belonged to the lithographers' union. Because most early rotogravure installations were in newspaper plants for printing supplements, the integration of gravure press workers was less controversial. These jurisdictional disputes reflected a clear understanding by the union's leadership that constant technological change within the industry threatened the security of their members. Only by extending jurisdiction over new processes would it be possible to provide opportunities for members whose jobs might become obsolete. Another aspect of this concern was the decision by the IPP&AU in 1910 to establish a Technical Trade School to train its members on new technology.[303]

For years workers in the lithography industry had violated the craft organizing principles found in other printing sectors. Camera, platemaking and other pre-press workers as well as press

300. *Penrose Annual* (1920), p. 5; *CPP* (Feb. 1924), p. 38; *CPP* (Feb. 1929), p. 41; *CPP* (Feb. 1950), p. 22; *CPP* (Aug. 1950), p. 34; *CPP* (April 1959), p. 56; *CPP* (April 1959), p. 56; Moran, *Composition*, pp. 69–70; Strauss, pp. 98, 100, 105–8; Arthur Phillips, *Computer Peripherals and Typesetting* (London: HMSO, 1968), pp. 452–53, 463–65.

301. Zerker, pp. 232–34, 246–47.

302. Elizabeth Baker, *Displacement of Men by Machines: Effects of Technological Change in Commercial Printing* (New York: Columbia University Press, 1933), pp. 180–84.

303. Baker, *Printers*, pp. 210, 319–28, 415–18, 437–41.

operators generally belonged to a single, industrial union, the Amalgamated Lithographers of America (ALA). As offset photolithography encroached more and more on the letterpress process, the ALA became embroiled in disputes with the pressmen's union, who claimed jurisdiction over offset press operators and feeders, the photoengravers' union, who coveted similar control of the plate makers, and the ITU, who were growing increasingly concerned about photocomposition. These disputes continued into the 1960s, a reminder that technology and the labour process were vexatious issues that organized workers struggled to find the means of controlling. Developments in the 1960s and 1970s would prove that industrial, not craft, unionism was the most promising avenue of advance.[304]

304. For a detailed account of the jurisdiction dispute see Baker, *Printers*, 415–36, Munson, pp. 98–99, 131–35, 140–44.

4 Printers and Computers, 1960–1990

In a career spanning more than thirty years, John Hamilton had by 1990 worked both ends of the Canadian printing and publishing industry. He began in the newspaper business in 1958, working his way up through the classified, marketing, circulation and production departments of the old Calgary *Albertan* to the office of publisher by the late 1970s. In 1977 he oversaw that paper's conversion to a morning tabloid, riding a trend toward low-cost, light, television-influenced journalism. In 1980 Hamilton's employer, the FP Publications chain, sold out to the multinational giant Thomson Newspapers and Hamilton was given a "golden handshake" at the age of 48. He was the victim of the most momentous year in the decades-long dwindling of the Canadian daily newspaper industry.

Hamilton worked for several years as a consultant to newspaper and printing companies. Noticing that rural weeklies actually made more money printing commercial work than they did publishing a newspaper, Hamilton concluded that "with one, two or three small presses a man could make a living." After a long career in the upper ranks of a large organization, Hamilton decided that "what I was really looking for was to earn some money without being dependent on someone else's corporation, someone else's decisions." So John Hamilton became one of Canada's several thousand small commercial printers. John supervised production, his wife Gerry did the books, his daughter-in-law worked reception and his two daughters, Leslie and Sharon took care of typesetting, graphics, layout, stripping and customer relations. The 1980s began and ended with recessions, "access to professions was getting slimmer and slimmer" and John Hamilton knew the sting of unemployment. He was only too happy to find jobs for his children and when he and Gerry retired, daughter Sharon planned to take over.[305]

305. *CPP* (Feb. 1990), pp. 18, 23.

The career of John Hamilton in many ways encapsulated the diversity of Canadian printing in the period after 1960. On the one hand, large, highly capitalized corporations continued to get bigger and to invest in the latest high-volume and high-quality production technology. On the other, small firms continued to proliferate, filling local or specialized niches not served by the giants and using inexpensive, flexible technology adapted to short print runs, frequent changes, and tight deadlines.

The key technological development in this period was the computer and the microchip. Initially, computers aided only the biggest firms and hence assisted in the concentration of the industry. But as microprocessors became cheaper and more capable, manufacturers installed them in even the least expensive lines of machinery. While press operators were increasingly aided by electronic controls, the real revolution occurred in the pre-press area. The term "pre-press" itself signified a blurring of the lines in such heretofore distinct operations as editing, typesetting, composition, stripping, camera-work and platemaking. Photo and laser typesetters, personal computers, desktop publishing systems, and image scanners all transformed the preparation of copy for printing. Moreover, through a variety of electronic printing systems, printing itself seemed by the 1980s about to be altered, as the archetypal relationship of ink to plate to paper was shattered.

Part 1 – Printing and Canadian Society, 1960–1990

Canada in the 1960s saw a continuation of the post-war boom.[306] In fact the decade was the longest period of sustained economic growth on

306. General historical information on the 1960-1990 period may be found in Bumsted, *Post-Confederation*, pp. 274–302, 343–424, 455–67, 471–514. References to various statistical information are cited separately below.

record. For most Canadians this translated into a steadily increasing standard of living. Average real wages increased 37 per cent in the decade, following similar increases of 43 per cent in the 1950s and 34 per cent in the 1940s.[307] Though the cost of living rose every year, employment was steadily increasing, and organized labour continued to be successful in gaining wage increases greater than the rate of inflation. More and more Canadians were earning these wages in the service sector, as both agriculture and manufacturing continued to decline in their relative importance to the economy. The baby boom ended after 1960 and birth rates and the rate of population increase fell. But the previously high levels ensured that in the 1960s spending on education grew steadily. During that decade also, important social programs were established, most notably Medicare and the Canada Pension Plan.

The 1960s also saw a blossoming of interest and concern for Canadian culture that continued through the 1980s. On the one hand, American television and popular music increased their penetration of Canadian households, threatening to overwhelm domestic voices. And Canada outside Quebec, thanks to decades of immigration, was coming to be spoken of as a multicultural society. On the other hand, the Centennial celebrations of 1967 inspired nationalist feelings and a search for distinctly Canadian forms of expression. Cultural initiatives in the "high culture" fields of literature, visual arts and performing arts taken in the 1950s also began to bear fruit.

Most experts and ordinary Canadians believed that the impressive economic performance of the 1960s would continue. But the period after the early 1970s was characterized by recession and slow growth, periods of high inflation, and chronically high unemployment, at times reaching levels not seen since the 1930s. Growth in real wages slowed to 9 per cent in the 1970s and just 2 per cent in the 1980s. Total family income after taxes still increased 22 per cent in the 1970s, thanks largely to millions of women entering the labour force. But even their contributions were not enough to increase stagnant family incomes in the 1980s. That decade began and ended in recession, and the inflationary boom that ran from 1984 to 1989 was restricted largely to southern Ontario and financed by personal, corporate and government debt. Despite the boom, the number of welfare recipients did not decline and, as governments curtailed social spending, the number of food banks actually increased.[308]

Of the job growth that did occur after 1970, 79 per cent was in services in the first decade and 90 per cent in the second. While some of these jobs paid mid-range to high wages, many were low-wage, low-skill, part-time jobs in retail and consumer services. The level of chronic, long-term unemployment among older male workers increased as manufacturers closed or cut back, eliminating relatively high-paying, unionized jobs. The 1980s in general were marked by a "hollowing out" of the middle class as society became more polarized between the rich and the poor.[309] Finally, at the end of the decade, the federal government signed the Free Trade Agreement with the United States. This signified a new phase in the transformation of Canada, as the country became even more closely integrated into the American economic, cultural and political orbit. At the same time, governments were cutting back their cultural funding and the country continued to struggle with the constitutional status of Quebec. In general, as the 1980s passed confidence in the Canadian national project waned and Canadian cultural "industries" were increasingly hard pressed to maintain their activities. As will be seen, the Free Trade Agreement and other economic circumstances also had a dramatic impact on the Canadian printing industry as it entered the 1990s.

Until these effects were felt, however, printing actually outpaced the growth of output in manufacturing as a whole. While lagging during the 1960s boom it kept pace in the following decade. Investments in new equipment in the early

307. Statistics Canada, (Stats. Can.) cited in: Ottawa *Citizen* (9 June 1993); *Globe & Mail* (9 June 1993); *Globe & Mail*, (6 July 1993).

308. Ibid.; Economic Council of Canada, *Globe & Mail* (29 Dec. 1990); Stats. Can., *Globe & Mail* (10 Sept. 1991); *Citizen* (1 Sept. 1992); Stats. Can. *Globe & Mail* (6 July 1993); Stats. Can., *Globe & Mail* (15 Dec. 1993); Stats. Can., *Canadian Social Trends* (Spring 1992), pp. 7, 10–11.

309. Stats. Can., *Globe & Mail* (21 July 1988); Economic Council of Canada, *Financial Post* (3–5 March 1990); Stats. Can., Ottawa *Citizen* (5 Feb 1991); Stats. Can., *Globe & Mail* (10 Sept 1991); Stats. Can., Ottawa *Citizen* (12 March 1992).

1970s contributed to output and productivity improvements through the decade. Output did drop during the recession of the early 1980s, but printing, publishing and allied industries were hurt less than other manufacturers. Printing sales growth in the 1980s exceeded that for manufacturing as a whole. By 1990, the industry accounted for 4.6 per cent of total manufacturing shipments, ranking it eleventh among industry groups. While its ranking was little changed from where it had been for most of the century, printing and publishing continued to show a small increase in its share of total manufacturing production. As an employer, the printing industry was even more important by 1990, accounting for 7.6 per cent of all manufacturing workers, making it the fourth largest manufacturing employer in the country. While total manufacturing employment increased by less than 50 per cent between 1960 and 1990, employment in the printing industry nearly doubled. Most of this growth occurred after 1970.[310]

One by-product of this growth in the 1970s and 1980s was a concern not before expressed by Canadians for the environmental impact of the graphic arts industry. Printing used considerable amounts of paper and chemicals, both of which posed a disposal problem, whether at the plant or by consumers. Impelled by public concern and government legislation, Canadian printers in the early 1970s were considering recycled papers and methods of reducing their emissions of liquid waste. Another spasm of public concern in the late 1980s focused on solid waste. Printed matter like newspapers, flyers and packaging were seen not only as being wasteful of scarce natural resources but also as posing a serious disposal problem. One popular environmental handbook estimated that 50 per cent of Canadian solid waste was composed of packaging. Another estimated that paper alone constituted 36 per cent of garbage in landfill sites. Another 19 per cent was glass, metal, or plastic, much of it packaging. Consumers were advised to follow the environmental "three Rs": reduce, reuse, recycle. Many municipalities established curb-side recycling programs. The federal government in 1990 instituted the National Packaging Protocol, which aimed to reduce the amount of packaging sent to landfills by half from 1988 levels by the year 2000. It did not, however, introduce regulations to meet these objectives.[311]

As the 1980s drew to a close, the printing industry was faced with an even more immediate threat, imports from the United States. For decades, Canada had run a trade deficit with the Americans in printed matter, despite protective tariffs. In 1960, for example, imports amounted to almost 10 per cent of Canadian production, and may have totalled 25 per cent if packaging on imported goods and if publications and direct mail posted to individuals were counted. In 1971 Canada imported eight times more printed matter than it exported. In 1975 the federal government produced a study encouraging printers to expand their export efforts in the United States. Most Canadian printers were not "export-conscious" and had little knowledge of the U.S. market. If they hoped to increase their exports, the study suggested that they would have to make their plants more specialized in order to make more efficient use of equipment. In addition, they would have to improve their price performance through volume purchasing of supplies and more "sophisticated" pricing. All this had implications for the structure of the industry, which became obvious after the Canada-U.S. Free Trade Agreement took effect in 1989.[312]

The agreement phased out tariffs on printed matter, some of which amounted to 24 or 28 per cent. But just at the time that tariffs began to fall, Canadian printers were hit by several other blows. The Canadian dollar increased in value, the GST was applied to reading matter, postal subsidies on periodicals were cut, and the Canadian economy went into recession. In 1989 alone printing imports from the U.S. rose 12.4 per cent while exports fell by almost the same amount. Major book and catalogue printers lost business to large American firms with better economies of scale. In 1990, American printers were estimated to be 20 per cent more produc-

310. Leacy, Series R1-22, R326-336; Statistics Canada, *Manufacturing Industries of Canada*, 1980, Cat. No. 31-203, p. xxi; *Canada Year Book, 1994*, pp. 554, 558.

311. *CPP* (Feb. 1973), p. 22; *CPP* (April 1973), pp. 10, 28; Paul Griss, *The Daily Planet: A Hands-On Guide to a Greener Environment* (Toronto: Key Porter, 1990) pp. 162-63; Pollution Probe, *The Canadian Green Consumer Guide* (Toronto: McClelland & Stewart, 1989, p. 106; *CPP* (April 1990), pp. 20-22.

312. *CPP* (Jan. 1963), pp. 53-54; *CPP* (March 1975), pp. 23-25; *CPP* (April 1981), p. 6.

tive than Canadians, partly because they spent 30 per cent more money each year on new plant and equipment. Imports from the U.S. continued to rise through 1992. While the balance between imports and exports improved in 1993, Canadian printers had by this time endured "the worst shakeout in the history of the industry." Among the casualties was the Murray Printing plant in Weston that had been one of the largest and most modern in the industry thirty years before. Now owned by the Southam chain of newspapers and commercial printers, the "old" plant with its "outmoded layout" was closed in 1990 in a consolidation of the parent company's commercial web printing operations.[313]

The effects on the structure of the Canadian printing and publishing industry were striking. "Acquisitions and mergers have become the most common theme," wrote the publisher of *CPP* in January 1990, "and the result is the closing or restructuring of many corporate friends after many successful years." The worst affected were medium-sized companies. This was not a trend that began with Free Trade but the acceleration of a decades-long process. In 1975 the federal study noted an ongoing consolidation among large and mid-sized regional and national printers. This would continue, in fact would be necessary, the report argued, if Canadian printers were to compete with Americans. During the 1980s large firms like Quebecor and Maclean Hunter did use their size to expand sales in the United States, but they did so not by exporting but by buying existing companies there. In fact by 1990 Canadian firms constituted 24 per cent of the foreign ownership in U.S. printing companies. Moreover, large Canadian firms met increasing U.S. competition in the home market by competing for jobs once left to medium-sized companies. These smaller firms had neither the size to meet aggressive price competition nor the capital to invest in more productive technology. In this environment, "continuous retooling" to achieve cost efficiencies was promoted by the trade press as an expensive but necessary key to survival.[314]

313. *CPP* (Jan. 1990), p. 3; *CPP* (May 1990), p. 42d; *CPP* (June 1990), pp. 22–25, 34; *CPP* (Sept. 1990), p. 56; *CPP* (Dec. 1993), p. 40.
314. *CPP* (March 1975), pp. 26–7; *CPP* (March 1987), p. 10; *CPP* (Jan. 1990), pp. 3, 9, 30; *CPP* (June 1990), pp. 22–25; *CPP* (Dec. 1993), p. 27; *CPP* (May 1994), pp. 26–28.

Just as markets were being redefined on continental lines, so too was marketing. Remi Marcoux, CEO of one of the printing giants, G.T.C. Transcontinental, said in 1990 that,

> *The day of the mid-sized catalogue, flyer and insert printer is gone, and the only way for us to survive is to grow. ... National and continental users of flyers would rather deal with one house than several, and to do this we had to have super-efficient equipment and a distribution network that would enable us to meet customers deadlines on a continental basis.*[315]

But even as marketing was being recast in continental terms, companies selling products were rejecting the notion of a mass market and mass marketing. As an influential business textbook told Canadian students in 1993:

> *Today's companies are finding it increasingly unrewarding to practice mass marketing ... Mass markets are becoming "demassified." They are dissolving into hundreds of micromarkets characterized by different lifestyle groups pursuing different products in different distribution channels and listening to different communication channels.*[316]

While the new marketing segments, based on lifestyle, were no less fictitious than the mass market, they did provide sellers with a more cost-effective means of reaching individuals likely to buy their products. By packaging alternative lifestyles, in fact, targeted marketing could take a vague desire for self-expression and channel it into consumption. While a variety of methods were used to address market segments, among the most popular were catalogues and direct mail. After 1960 these held a relatively constant 20 per cent share of advertising spending. But the composition of this sector changed with the demise of mass market catalogues (like Eaton's in 1976) and emergence of specialty products publications. Moreover, surpassing catalogues in importance by the 1990s were the miscellaneous letters, flyers and foldouts known, according to preference, as direct mail or junk mail. Based on targeted mailing lists and often "personalized" appeals, direct mail campaigns

315. *CPP* (June 1990), p. 25.
316. Philip Kotler & Ronald E. Turner, *Marketing Management: Analysis, Planning, Implementation, and Control*, 7th Canadian Edition (Scarborough: Prentice-Hall, 1993), p. 279.

proved very successful. During the 1970s and 1980s direct mail was consistently one of the fastest growing sectors of the printing industry.[317]

Among the beneficiaries of the use of direct mail were the small shops that excelled at producing low cost, short run work for local markets. "Instant" or "quick" printers first came to the attention of the printing industry in the 1960s. One of the first and most successful was The Printing House, established in Toronto in 1962 with just three employees. This firm specialized in very short run offset work of 100 copies or so, which it ran on small A.B. Dick and Multilith duplicators. Offering one to four-day turnaround on short runs of books, proposals, manuals, reports, catalogues and brochures, the firm found a ready market and had by 1967 expanded to 14 employees. Through the 1970s quick printing was a growth industry as The Printing House and other successful businesses established chains. In 1978 two American franchisers, Kwik-Kopy and Minute Man Press entered the Canadian market. By 1990 Kwik-Kopy had 110 locations and was the largest quick printer in Canada. Its $60 million in sales were equivalent to the output of the fifth largest printing plant in the country. Most of the other large quick printers were also franchise operations. One exception was The Printing House, which had grown to 56 company-owned locations by 1990, making it the fourth largest quick printer in the country.[318]

Serving a similar purpose to quick printers, and using much the same technology, were the captive, or "in-plant" shops run by non-printing organizations to reproduce their own reports, forms, stationery and other documents. Among the most important operators of in-plant print shops were governments, manufacturers, and legal and financial services companies. Among the largest were the federal government (Canada Communications Group—formerly the Queen's Printer), Ontario Hydro, and Bell Canada. The main advantages of printing internally were quick turnaround and complete security of information. About 600 in-plants were in operation in 1990.[319]

In 1960, the printing industry was composed of a multitude of small shops that produced a fraction of total output while a few very large establishments accounted for the majority of production. This was unchanged in 1990. The average number of employees per plant had increased gradually from 21 in 1960 to 26 in 1990. This, however, was still far smaller than the average manufacturing operation, which had 47 workers in 1990. Printing plants employing fewer than 10 workers accounted for 57 per cent of all establishments but produced just 7.6 per cent of output. Average wages in these small operations were low, about $26,000 per worker. Over half of output (55 per cent) was produced by just 4.7 per cent of plants that employed 100 or more workers. These 260 plants, which employed 40 per cent of all printing workers, paid their workers fully one third more than their counterparts in small shops, about $34,000. Many of these plants, moreover, were part of large, multi-plant corporations. In 1992, for example, 7 of the 20 largest commercial printing plants in Canada (by sales) were owned by Quebecor Printing, the second largest commercial printer in North America. Two plants were owned by G.T.C. Transcontinental, seventh largest, and one by Maclean Hunter, eighth largest. This did not even include daily newspapers, where concentration was even more advanced.[320]

The structure of the printing industry did change in several ways between 1960 and 1990. Establishments that both "published and printed" publications (mostly newspapers and magazines) declined steeply in number and share of output. The decline had begun in the 1950s, sales falling from 49 per cent of total output in 1950 to 42 per cent in 1960, 38 per cent in 1970, 31 per cent in 1980, and 23 per cent in 1990. At the same time, those establishments engaged in "publishing only" increased from 11 per cent in 1960 to 23 per cent in 1990. This indicated two trends, an increase in book publishing activity and a tendency for periodical publishers to have their work printed elsewhere.

317. *CPP* (Jan. 1978), p. 24; CPP (Jan. 1984), p. 20; *CPP* (Dec. 1990), pp. 28–30; Kotler & Turner, pp. 657–58.
318. *CPP* (July 1967), pp. 88–90; *CPP* (May 1978), p. 55; *CPP* (Sept. 1990), p. 60; *American Printer* (Aug. 1990), p. 28.
319. *CPP* (May 1993), pp. 17–18.
320. Statistics Canada, *Printing, Publishing and Allied Industries, 1990*, p. 10; CPP (June 1993), p. 34; Canadian Business, (Nov 1993), p. 24.

Between 1960 and 1990 sales of published-only newspapers and periodicals grew at twice the rate of those printed by the publisher. The most decisive decade was the 1970s. By 1990 one third of newspapers and periodicals were printed for the publisher, up from one fifth in 1960. Indicative of the decline in integrated publishing and printing, "commercial printing" gradually increased its share of total production, from 41 per cent in 1960 (including lithographing) to 46 per cent in 1970, and 48 per cent in 1980 and 1990. The number of trade establishments doing platemaking, typesetting and binding, finally, remained constant at about 6 per cent of industry shipments until the 1980s. Between 1980 and 1990 trade shops' share of industry output jumped to 9 per cent. Among the causes of this trend were the increasing technical demands of pre-press operations. General printers began to purchase these services from trade houses that could afford the latest in scanners, imagesetters and other electronic technology and could find the skilled specialists needed to run them.[321]

Turmoil in the Publishing Industries

In 1960, three quarters of Canadian homes had a television set, and viewing had already become the most popular in-home leisure activity. By the end of the 1980s this situation was little changed. Almost every household possessed at least one set, and the federal government reported that "the average Canadian spends more time watching television than at any other leisure activity:" about 23.4 hours per week in 1989. In contrast, Canadians spent 4.4 hours reading books, 3.6 hours reading newspapers, and 2.1 hours reading magazines. Despite the preponderance of television, printed media had a vestigial legitimacy as purveyors of information and culture that television, with its lowbrow reputation, could not command. Due partly to the impact of television on readership and advertising, but also due to such structural factors as U.S. competition and corporate concentration, the field of publishing was contentious for much of the period after 1960. Because they were seen as central to Canadian political and cultural sovereignty, book, newspaper, and magazine publishing were on several occasions investigated by government commissions.[322]

The book publishing industry was the smallest of the three sectors but was culturally far more valuable than its meagre returns indicated. Canadian firms had for decades survived by publishing textbooks and by acting as exclusive agents for foreign publishers, sometimes printing foreign titles in Canada. Thanks largely to funding from the Canada Council, Canadian literary activity boomed in the 1960s and many small literary presses were established. But by the end of this same decade the long-established, English-Canadian firms like Ryerson Press, Clarke Irwin, W. J. Gage, and McClelland & Stewart were in dire circumstances. In 1970 W. J. Gage and Ryerson Press were both sold to American publishers. The Canadian firms' secure market in textbooks had collapsed. Provincial education departments were decentralizing textbook selection. Schools and teachers were buying a wider variety of titles in smaller quantities, many of them American. No longer was a textbook kept in use for up to a decade. No longer, therefore, could Canadian publishers spread development and production costs of a textbook over tens of thousands of copies. American publishers could more cheaply supply this market by adapting their existing line to Canadian schools. Canadian firms were also losing their contracts as agents for foreign publishers, several of whom set up their own Canadian subsidiaries. Even worse, Canadian public and university libraries increasingly took to "buying around," circumventing Canadian agents to buy directly, and at a discount, from large American wholesale houses.[323]

321. DBS, *Printing Publishing and Allied Industries, 1960*, pp. 10, 15; Statistics Canada, *Printing, Publishing and Allied Industries, 1970*, pp. 5, 10, 13, 19, 24; Statistics Canada, *Printing, Publishing and Allied Industries, 1980*, pp. 1, 6, 10, 13, 15, 18; Statistics Canada, *Printing, Publishing and Allied Industries, 1990*, pp. 15, 20; *CPP* (Aug. 1984), pp. 40–41; *CPP* (Feb. 1987), p. 26; *CPP* (Sept. 1987), pp. 88–89.

322. Vipond, pp. 49, 53; *Canada Year Book, 1992*, p. 513; *Canada Year Book, 1994*, p. 357.

323. For a summary of the situation in 1970, see *CPP* (Nov. 1970), pp. 35–37. For an overview of the period from 1960 to the early 1980s see Paul Audley, *Canada's Cultural Industries: Broadcasting, Publishing, Records and Film* (Toronto: Lorimer, 1983), pp. 85–136. For detailed studies of the Canadian publishing industry see: Canada, Industry Trade & Commerce, *The Book Publishing and Manufacturing Industry in Canada: A Statistical and Economic Analysis* (1970); Ontario, *Royal Commission on Book Publishing: Background Papers* (1972).

In December 1970 the Ontario government established a Royal Commission on Book Publishing and as a result instituted loan guarantees for Canadian firms. In the 1970s and 1980s a variety of other provincial and federal funding programs were established to subsidize both the firms themselves and individual titles. But Canadian publishers in general remained chronically undercapitalized and with a small market that made it impossible to compete with the huge, foreign-based firms, especially in the areas of promotion, order fulfilment, and manufacturing where economies of scale could be achieved. In 1984–5, 76 per cent of book sales in Canada were imported titles and foreign-controlled firms accounted for 65 per cent of sales. Textbooks were still the most important business for Canadian publishers, in 1985–86 accounting for 41 per cent of sales of English publishers. French-language publishers were less affected by foreign control and competition, and contended with their smaller market by counting on textbook sales for 63 per cent of revenue. Despite their precarious existence, Canadian-owned firms were an important part of the Canadian cultural landscape, publishing three quarters of all books by Canadian authors.[324]

Magazine publishers had a similar story to tell. To some extent, however, the fate of magazines was not unique to Canada. During the 1960s general magazines in both the United States and Canada were in decline, largely attributed to competition from television. Advertisers spent their money according to the size of the audience they hoped to reach. In 1960 general magazines and weekend supplements earned 3.8 and 3.1 per cent of all advertising revenues, compared to 9.1 per cent for television. Over the next fifteen years, the share taken by magazines and supplements fell, while television's increased inexorably. By 1975 television took 14.1 per cent of ad revenues, while magazines settled for 2.4 per cent and supplements 1.2. During this period, many magazines and supplements in the United States and Canada went out of business.[325]

The situation in Canada, however, was exacerbated by the long-standing structural limitations of the small Canadian market and competition for circulation and advertising revenues from direct imports, "split run" American editions with Canadian-directed ads, and Canadian editions of American magazines. This situation continued to concern Canadian cultural nationalists of all political stripes. Announcing that "Canadian magazines and periodicals add to the richness and variety of Canadian life and are essential to the culture and unity of Canada," in 1960 the federal government had established the Royal Commission on Publications (the O'Leary Commission). As a result, in 1965 foreign magazines with advertising explicitly directed at Canadians (the "split run" editions) were barred from entering Canada, and tax deductions for advertising by Canadian companies in foreign periodicals were abolished. The Canadian editions of *Time* and *Reader's Digest* were exempted from this final provision, however, reputedly under diplomatic pressure from the United States. The situation for Canadian magazines did not immediately improve and *Time* and *Reader's Digest* were by 1969 taking in 56 per cent of all Canadian magazine ad revenues, up from 40 per cent a decade earlier. In that year the Davey Committee of the Senate pronounced that "magazines constitute the only national press we possess in Canada" and that "creeping continentalism has proceeded far enough." Carrying out the Davey Committee's main recommendation, Bill C-58 in 1975 eliminated the tax exemption for *Time* and *Reader's Digest* (although the latter managed to retain its status by reconstituting as a non-profit Canadian foundation).[326]

The fortunes of the Canadian magazine industry improved after the mid-1970s. The last of the weekend supplements disappeared in 1982, but many other magazines were established. Almost half the magazines circulating in Canada were established between 1971 and 1986. *Maclean's* was relaunched with some success as a weekly news magazine. Canadian magazines increased their share of total circulation from 30 per cent to 40 per cent and their share of subscriptions

324. *CPP* (Feb. 1973), p. 50; *Canada Year Book, 1988*, pp. 15–11 – 15–14; *Canada Year Book, 1990*, pp. 15–1, 15–2, 15–14; *Canada Year Book, 1992*, pp. 506–9. For more information on the period since 1970, see: Audley, pp. 85–136; Canada, Secretary of State, *The Publishing Industry in Canada* (1977); Canada, Communications, *Report of the Federal Cultural Policy Review Committee* (1982), pp. 210–22.

325. *CPP* (Jan. 1978), p. 24; Sutherland, pp. 181–82.
326. Sutherland, pp. 182–88; 207–10; Vipond, pp. 62–67.

from 37 per cent to 60 per cent. Advertising revenues also improved, general magazines increasing their share from 2.5 per cent in 1970 to 4.4 per cent by 1980. Most of the new magazines succeeded by targeting their circulation to affluent readers or groups with specialized tastes. For a time, "controlled-circulation" magazines gained success by circulating free to affluent households. "City" magazines were similarly aimed at upmarket consumers. But as if to illustrate the marginal position of Canadian periodicals, the most-read magazines in French and English in the 1980s were TV guides. Of more immediate concern to magazine publishers as the 1990s dawned were federal government cuts in postal subsidies that had for about a century supported the circulation of periodicals.[327]

The daily newspaper industry, Canadian-owned and largely supported by local advertising, did not meet the same competitive pressures from the United States. But newspapers did have to contend with competition from radio and television. Though they continued to be the most important advertising medium in Canada throughout the period between 1960 and 1990, their share of advertising spending dropped from about 31 per cent in 1960 to 26 per cent in 1980. In the latter year, surveys also revealed that for all but local news, the public preferred television or radio as their information sources. Although the number of dailies continued their decades-long decline, total newspaper circulation increased. But daily newspapers were definitely a "mature" industry, with circulation just keeping pace with population growth. During the 1970s, virtually all the circulation growth came from the increasing popularity of papers like *Le Journal de Montréal*, and the Toronto *Sun*: morning tabloids, whose crime, sex and sports content conveyed in breezy, pictorial style was aimed at a new audience whose tastes were formed by television. Increasingly, the market was becoming segmented into lowbrow tabloids, middlebrow papers like those available in any city of any size, and highbrow "national" dailies like the *Globe & Mail* and *Le Devoir*.[328]

While this trend was notable, it occurred alongside another one that caused far more controversy. From 1960 through to 1990 ownership of daily newspapers continued to fall under the control of chains. Increasingly, the chains were themselves just elements in larger national and international conglomerates, some devoted to print and electronic media, others being active in non-media services like oil, commercial printing and retailing. By 1980, 77 per cent of all daily newspaper circulation was controlled by chains, amounting to over 90 per cent in most of Western Canada, in Quebec and in parts of the Maritimes. The number of independent dailies in Canada dropped from 45 in 1970 to 29 in 1980 to 14 in 1990. The most dramatic year in this concentration was 1980, when the Thomson organization purchased FP Publications and its chain of dailies that included the *Globe & Mail* and the Winnipeg *Free Press*. Within months, newspaper competition in several Canadian cities was eliminated, as Thomson and its main competitor, Southam, sold, closed or merged papers. While some cities retained more than one paper, true competition ceased to exist as papers were "positioned" to serve different markets. In several cases, both papers were owned by the same company, one serving the traditional urban and suburban, middlebrow market, the other aimed at tabloid readers or at subscribers in the region surrounding the city.[329]

Several reasons were given for the trend toward concentration, all observable in other countries as well. As noted above, newspaper publishing could not count on rapidly expanding markets. In the economic difficulties of the 1970s and 1980s, papers were reluctant to raise subscription and newsstand prices, thus making themselves even more dependent on advertising revenues. Dependence on advertising favoured the dominant papers in any one city because they could profitably sell ads at lower rates per reader. Finally, newspapers in the 1970s and 1980s made large investments in new technolo-

327. *CPP* (Jan. 1978), p. 24; *CPP* (Jan. 1984), p. 20; *CPP* (April 1990), p. 7; Sutherland, pp. 257–68; Vipond, pp. 66–67; 154–56.

328. *CPP* (Feb. 1978), pp. 16–17, 19–21; *CPP* (July 1981), p. 24; *CPP* (Jan. 1984), p. 20; *Canada Year Book, 1988*, p. 14–17; *Canada Year Book, 1994*, p. 360; Canada, *Royal Commission on Newspapers* (1981), pp. 2, 5, 33–38, 64–65 (hereafter cited as Kent Commission).

329. *CPP* (July 1980), pp. 28–33; *Kent Commission*, pp. 1–14.

gy, especially computerized editorial systems and offset presses, in order to reduce production costs and improve print quality. All factors discouraged small competitors and new entrants and favoured newspapers that were already the largest in their markets and that had access to the capital of wealthy owners.[330]

While all these economic considerations were acknowledged by concerned observers, they believed that due to the traditionally active role of newspapers in political affairs, concentration in newspapers was more serious than in other industries. In 1969 the Davey Committee had argued that "this country should no longer tolerate a situation where the public interest in so vital a field as information is dependent on the greed or goodwill of an extremely privileged group of businessmen"[331] It recommended the formation of a "Press Ownership Review Board," but this was not acted upon. In 1980, in the aftermath of the Thomson takeover of FP, a Royal Commission on Newspapers (Kent Commission) was established. It similarly argued that despite the influence of radio and television, newspapers remained the originator of most news and were the "medium of record," providing detailed, in-depth reports referred to by other media. "In the complex interplay of decision-making in a democratic society," wrote the commissioners, "the way the newspapers handle the news is ... one of the main determinants of the society's affairs"[332] "Freedom of the press" from all government interference no longer ensured the desired result of "diverse expression," complete and accurate public information, responsible exercise of the power of the press. "The affirmative action of law" was required to "protect society against the claims that its powerful minorities may impose on others"[333]

> *In a country that has allowed so many newspapers to be owned by a few conglomerates, freedom of the press means, in itself, only that enormous influence without responsibility is conferred on a handful of people. For the heads of such organizations to justify their position by appealing to the principle of freedom of the press is offensive to intellectual honesty.*[334]

330. *Kent Commission*, pp. 66, 71–72, 81, 216.
331. Ibid., p. 17.
332. Ibid., p. 216.
333. Ibid., p. 237.
334. Ibid., p. 217.

The Kent Commission proposed legislation preventing further concentration of holdings of existing newspapers and calling for the divestment of ownership where the same company controlled newspapers and radio or television outlets in the same city, or where all papers in a province or region were owned by the same corporation. While some electronic media divestment was carried out, most of these recommendations were not taken up, and through the 1980s and early 1990s, newspaper concentration continued.[335]

Responding to the Electronic Revolution

The growing entanglement of print and electronic media evident in newspaper ownership was symptomatic of a trend being felt throughout the graphic arts industry. Publishing was losing audience and advertising to electronic media. In addition, some industry observers predicted that the use of integrated communication networks, computers, and high-volume information storage systems like CD-ROM would further cut into the traditional domain of printers and publishers.

Some companies embraced the new technology by investing in videotex experiments, on-line business information services, or CD-ROM packages. Among these were business forms manufacturers. Ironically, computer use actually increased the demand for some kinds of forms. As well, forms makers increasingly used computer technology to design and produce their products. But their markets began to erode as clients turned to electronic mail and data exchanges for routine communications. In addition, software companies like Delrina of Toronto were successfully selling packages that allowed users to produce their own forms on office computers and laser printers. In response, forms makers like Moore Corporation began to diversify from manufacturing into consulting, direct marketing, and data base services. Known collectively as "information management services," this work accounted for almost one fifth of Moore's sales by 1993.[336]

But by far the most common response among printers and publishers was to exploit the new technology to make their traditional products

335. Ibid., pp. 238–44.
336. *CPP* (Feb. 1984), p. 28; *CPP* (Jan. 1987), p. 59; *CPP* (Feb. 1990), pp. 24–29; *Globe & Mail* (10 Aug. 1993); *Globe & Mail* (21 Jan. 1994).

more attractive and their operations more profitable. Newspapers installed computerized editorial systems and invested in colour presses. Commercial printers bought computer typesetters and pre-press systems, electronic scanners, and offset presses with computerized colour and register controls. Electronics and computers were altering the competitive environment for printing. But at the same time these technologies were being incorporated into the printing process.

Part 2 – Technology: The Digital Revolution

In 1960, printing in Canada was still largely dominated by hot metal type and letterpress presses, technology unchanged in its fundamentals since the 19th century. Industry experts, however, identified several important trends: the continuing switch to offset, increasing use of photocomposition and photographic methods generally, growing recourse to electronic colour separation. All were technologies that had existed before 1960 but which were not yet fully exploited. A 1964 census of printing equipment covering about half of Canada's commercial printers, for example, showed they still used twice as many letterpress as offset presses. And they operated only 319 phototypesetters, compared to over four thousand hot metal machines. The majority of letterpress machines, though, were over ten years old, while exactly the reverse was true for offset and phototypesetting technology.[337]

The 1964 census also reported 193 electronic engraving and colour separating machines, of which the vast majority had been installed since 1960. Like phototypesetting, electronic image processing was expected to grow. Barely anticipated by some was a development in electronics that would have a monumental impact on all aspects of printing: microprocessors and digitization. But others were already calculating the impact of still-novel computers. In 1963 *CPP* reported a forecast made before the American Society of Newspaper editors:

> *Editorial copy, from wire or reporter's typewriter, will be fed into a computer-like system, augmented by material brought from the computer's morgue. It will all be manipulated electronically, displayed on TV screens, dummied by use of light-pencils and light-erasers. ...*
>
> *There will be no more typesetting on most papers. The page image, created from computer and tape, will be approved on a display screen and transmitted directly to the printing plate ...*[338]

The transition was already underway, as the first computers were being installed in newspaper plants at this very time. In 1965, electronics accounted for just 15 per cent of the sales of Harris-Intertype, builder of offset presses and typesetting machines. By 1970 half the company's sales were in the electronics field, by 1975 almost two thirds. By 1984 one *CPP* report on a printing trade show concluded that in pre-press, "it would be difficult to overrate the importance of digital data handling," while another concluded that in the press room and bindery, "the industry is now totally reliant on microprocessors for controlling everything from inking to cutting." In less than thirty years, the world of hot metal, relief printing was swept away, replaced by offset lithography, photographic methods, electronics and computers. By the 1980s, fully electronic operations up to the platemaking stage were a reality. Many observers even envisaged the disappearance of print, as electronic means of information transmission, storage and display achieved primacy.[339]

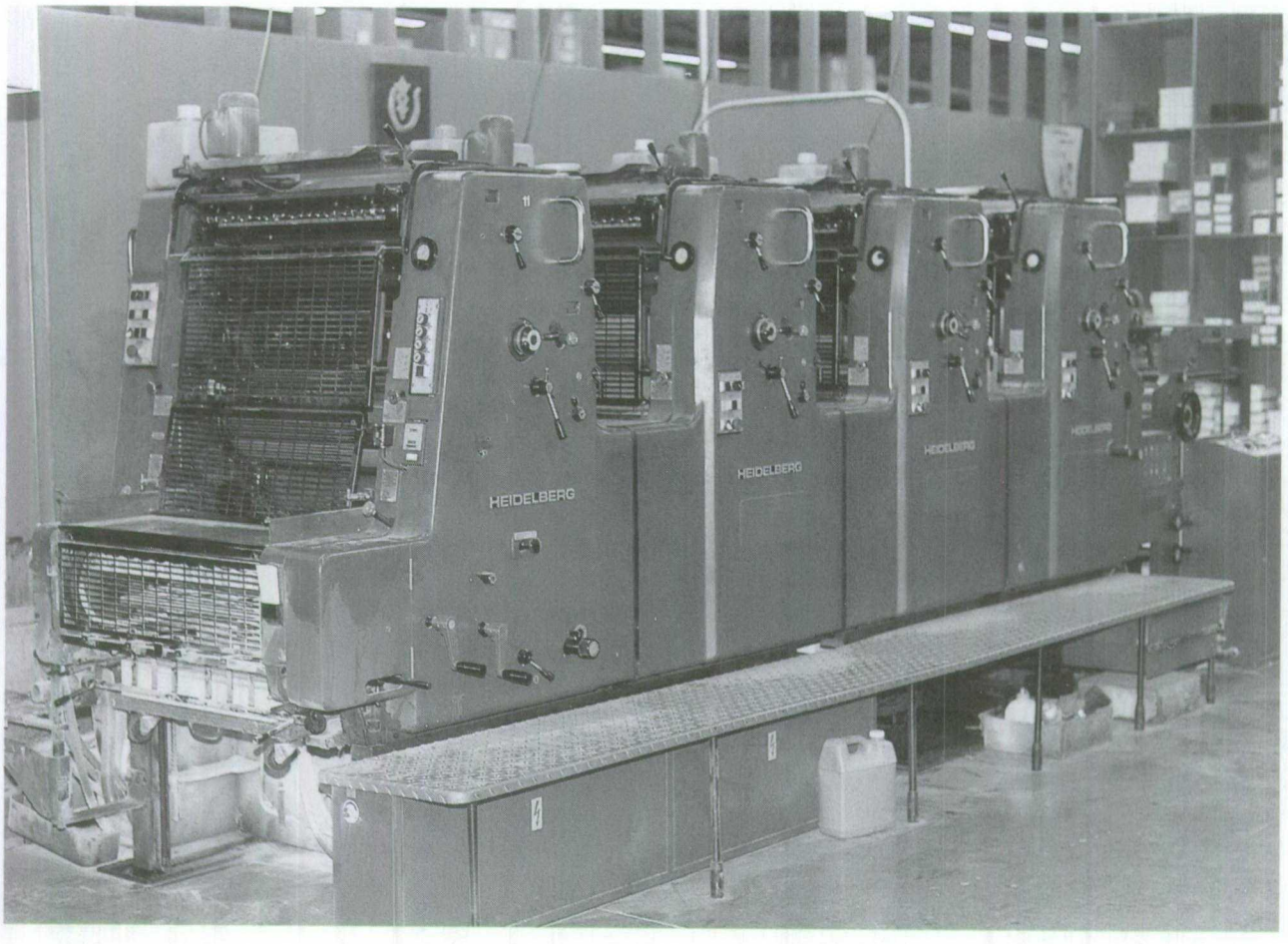
Presses: Offset Supplants Letterpress

The shift from letterpress to offset lithography, save for a few daily newspapers, was completed in the 1960s and 1970s. In commercial work, growing demand from advertisers for colour favoured offset for its cost advantages over letterpress. But even in book production, where letterpress had retained some advantages, offset became the standard. By 1972 offset book output in Canada was estimated to outnumber letterpress 5 to 1. By the 1970s the period of high growth and high profits for American sheet-fed offset press manufacturers appeared to be over. Recession, increasing offshore competition, low prices, and unfavourable labour costs and exchange rates caused most U.S.-based manufacturers to move their production overseas. The

337. *CPP* (Feb. 1960), p. 49; *CPP* (June 1963), p. 64; *CPP* (May 1964), pp. 79, 84–93.

338. *CPP* (May 1963), p. 5.

339. *CPP* (Dec. 1970), p. 62; *CPP* (March 1975), p. 30; *CPP* (Oct. 1984), pp. 23–24; *CPP* (Dec. 1984), p. 30.



Heidelberg four-colour offset press (sheet-fed), Dicks & Co., St. John's, Newfoundland, 1986. (NMST)

market for presses was becoming international. By the end of the 1980s, three of the four largest press builders in the world were German: Heidelberg, MAN Roland, and Koenig & Bauer-Albert Frankenthal (KBA). Some firms like Harris got out of sheet-fed altogether. Web offset remained a high-growth area and was one of the notable technological developments of the period. But sheet-fed offset continued to be used for the majority of work, and technical improvement did not cease. In the 1980s, press builders upgraded their presses with increasingly sophisticated microprocessor controls.[340]

Until the 1950s web offset was used mainly for special, mass production jobs and was not considered capable of high quality, economical work. But developments in inking and web tension control and the adoption of dryers and heat-set inks greatly improved register and reduced set-off and smudging on high-speed, multi-colour runs. Faster and requiring less labour to operate and using roll paper instead of more expensive sheets, web presses began to prove economical for high production jobs. Folding, pasting, stitching, and other finishing operations could also be attached to the press to deliver a finished product without further processing. But the high initial cost of web offset presses limited their use to a few printers who had the high volumes to keep the machines busy. Moreover, the cutoff size on any job had to correspond to the circumference of the plate cylinder, limiting a press to products of certain dimensions. As one supplier told printers, by investing in web machinery they would be "placing a great many eggs in a single basket." For this reason, web presses were only used by the large commercial and publication printers, producing catalogues, books and directories, magazines, newspapers, and retail flyers. For example, in 1963 Ronalds-Federated of Montreal and Litho-Print of Toronto were using web offset to print books, directories, inserts and magazines. In 1966 Columbia Craftsmen Printers of New Westminster used a Cottrell Vanguard V22 press to print 90 per cent of the grocery flyers in British Columbia. In the late 1970s and 1980s, manufacturers introduced "half-size" or "eight page" presses that printed on a narrower web, making them competitive with large sheet-fed presses on medium-run jobs.[341]

Perhaps the most obvious role for web offset printing was in the newspaper field. It could produce excellent results on newsprint, allowed profuse illustration at a reasonable cost, and due to the relatively low cost of plates, could produce run-of-paper colour more cheaply than by letterpress. Moreover, if combined with cold composition and paste-up methods (see below), pre-press costs were reduced substantially. The first offset newspapers emerged in Canada in the late 1950s. They were small weeklies, typeset on electric typewriters and printed on sheet-fed duplicators like the Multilith 2066. At around this time, press manufacturers began to sell web machines specifically designed for the weekly newspaper market. The earliest had been the ATF Webendorfer. But by 1960 this was joined by, among others, the Polygraph Web-Master (East Germany), the Cottrell Vanguard and, most importantly, the Goss Suburban. Goss later added the Urbanite and Community presses to its line for small newspapers and the Metro-Offset and Metroliner for dailies.[342]

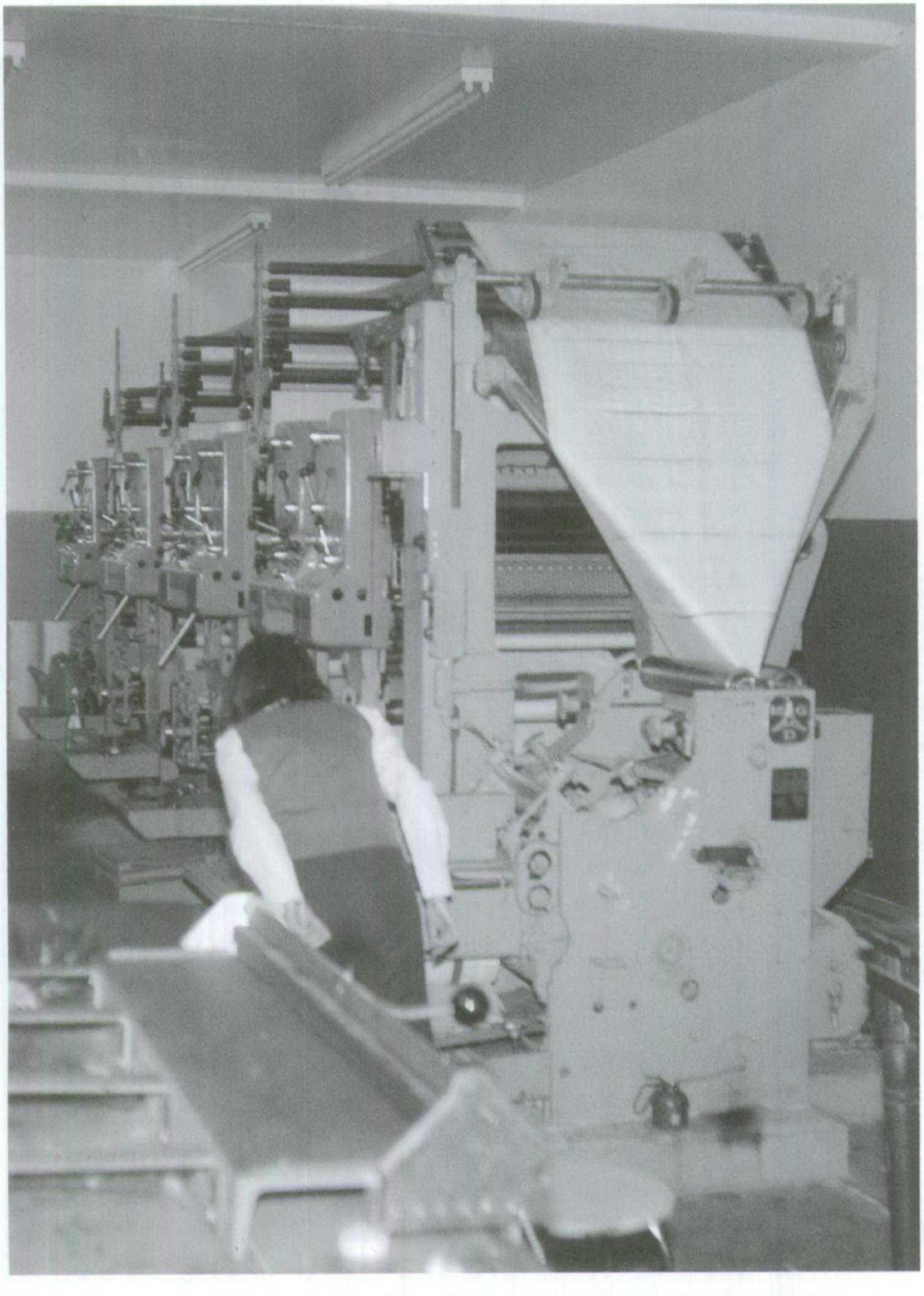
Web offset first made an impact in Canada on weekly and small daily newspapers in the early 1960s. In some cases, papers were due to replace worn-out presses or linecasters. Others had outgrown their flat-bed web presses and wanted a less costly alternative to buying a rotary press and investing in stereotyping equipment. In 1966 for example, the weekly Temiskaming *Speaker* replaced its Goss Cox-o-Type with a Goss Community 3-unit offset press.[343] In other cases, offset offered publishers relief from rising production costs and skilled

340. *CPP* (Feb. 1960), p. 59; *CPP* (March 1975), pp. 29–31; *CPP* (June 1975), pp. 23, 25; *CPP* (Sept. 1975), pp. 40–41; *CPP* (April 1990), p. 16; C. J. Eustace, "Developments in Canadian Book Production and Design," in Ontario, *Royal Commission on Book Publishing*, p. 48.

341. *CPP* (June 1959), p. 62–63, 72; *CPP* (Dec. 1959), p. 68; *CPP* (April 1960), pp. 73–78; *CPP* (April 1960), pp. 74–76; *CPP* (Jan. 1963), p. 59; *CPP* (March 1963), pp. 51–53; *CPP* (Oct. 1966), pp. 53–54; *CPP* (June 1978), p. 41; *CPP* (Aug. 1981), p. 27; *CPP* (Dec. 1981), pp. 17–18; *CPP* (Feb. 1984), pp. 22–23; Strauss, pp. 297–303.

342. *CPP* (Feb. 1957), pp. 54–55; *CPP* (June 1958), pp. 72, 78; *CPP* (Aug. 1960), pp. 63–65; *CPP* (Nov. 1958), p. 17; *CPP* (June 1959), p. 24; *CPP* (July 1963), pp. 8, 60; *CPP* (Sept. 1963), p. 30.

343. That same year due to printers' preference for web offset, Goss stopped making the Cox-O-Type. The last one was sold to *Zwiazkowiec*, a Polish semi-weekly published in Toronto: *CPP* (Oct. 1966), pp. 50–51.



Goss Community web offset press. Replaced a Cox Duplex press, Shing Wah Daily News, *Toronto, 1979. (NMST)*

labour shortages and allowed new papers to be established without large investments. But many publishers still could not afford the capital cost of a new offset press and the photographic and platemaking accessories also required. Increasingly, both suburban and rural weeklies had their papers "printed out" either by commercial web shops or by slightly larger town publishers. In 1966 the publisher of the weekly Goderich *Signal-Star* invested in offset on the strength of contracts to print several other weeklies in surrounding Huron County. The Goderich publisher hoped to eventually print 8–12 weeklies, thus saving them from closing entirely. A boom in suburban weeklies, often free distribution papers, was also facilitated by printing out. In greater Vancouver, the Ladner *Optimist* was printed on a Goss Suburban on the premises of the *North Shore Citizen*. In Winnipeg, the St. James *Pictorial Review* and the Assiniboia *Flyer* were sent out of town for printing by the Beausejour *Beaver*. Toronto's Web Offset Publications Ltd. printed several community papers, including the Oakville Beaver and suburban weeklies in Don Mills, Scarborough and North York. By the 1970s the move to web offset was almost complete. In 1975, for example, only four of Saskatchewan's 74 rural weeklies were still printed letterpress.[344]

Early in the 1960s, a few small dailies had chosen offset, among them the Guelph *Guardian* (1960), using a Polygraph Web-Master and the Prince George *Citizen* (1963) and Granby's *La Voix de l'est* (1964), both of which ran Goss Urbanites. Most metropolitan dailies did not begin converting to offset until the 1970s, when rising costs and the demand for better colour and pictures encouraged them to switch. The first were the new morning tabloids, *Le Journal de Montréal* (1964) and the Toronto *Sun* (1971), though both initially "printed out." In 1973 the Ottawa *Citizen* opened a new suburban plant equipped with a 12-unit Goss Metro-Offset press. By end of 1974, 74 Canadian dailies were printed offset. The largest of these were the three papers mentioned above; most others were small-city dailies in such centres as Kamloops, Lethbridge, Brandon, and Moncton. Most observers expected the large dailies to stick with letterpress, but their projections were confounded in 1975 when the New York *Times* ordered 36-unit Goss Metroliner for its New Jersey satellite printing plant. In that year, Goss could advertise a full line of web offset presses designed for all sizes of daily. By 1987, 80 per cent of U.S. dailies, representing more than 60 per cent of circulation, were printing offset. One by one large Canadian dailies went offset. As if to affirm the continuation of this trend, in 1990 the Toronto *Star*, Canada's largest daily, ordered 6 12-unit MAN Roland Colorman presses for its new production facility north of the city. These machines could produce up to 28 pages of full colour. The *Star* plant reached full production in 1993. Early in 1994 the *Globe & Mail* announced it would close its press room in Toronto and contract out to an offset printer. The *Globe* was one of the last major dailies in North America printed by letterpress.[345]

In 1978 Grant C. Beutner, president of a company making lithographic plates and chemicals, announced that the lithographic process had "crested out" and would likely reach its technological limits within 20 to 30 years. While average quality and speed had improved greatly in the past century, "ultimate quality" had not. To achieve higher average quality, moreover, involved a loss in speed. And due to what he believed to be a decline in printers' skill, the onus for quality was increasingly falling on suppliers of paper, ink, chemicals, plates and machinery. Beutner predicted that the emerging dominant process would be electronic.[346]

It remains to be seen if Beutner was correct. It is clear, however, that in the 1980s, press builders resorted to a variety of computerized press controls in order to improve average quality without loss in speed. Press operators had always been responsible for quality control while setting up and running presses. Before each job, blankets had to be washed, plate and blanket

344. *CPP* (April 1960), p. 76; *CPP* (Dec. 1960), p. 69; *CPP* (Jan. 1963), pp. 55, 62–5; *CPP* (March 1963), pp. 65–66; *CPP* (Oct. 1963), pp. 92, 96; *CPP* (Nov. 1963), pp. 53–54; *CPP* (Oct. 1966), pp. 50–51; *CPP* (Dec. 1966), p. 36: *CPP* (Feb. 1967), pp. 27–28; *CPP* (Nov. 1975), p. 5; *American Pressman* (Nov. 1965), p. 51.

345. *CPP* (Oct. 1960), pp. 65–68; *CPP* (March 1963), p. 84; *CPP* (Nov. 1964), pp. 53–54; *CPP* (July 1964), p. 77; *CPP* (Aug. 1970), p. 56; *CPP* (Feb. 1973), pp. 25–26; *CPP* (Feb. 1974), p. 44; *CPP* (Feb. 1975), pp. 21–22; *CPP* (Sept. 1975), p. 15; *CPP* (Feb. 1987), p. 25; *CPP* (July 1990), pp. 4. 40–1; *CPP* (Dec. 1992), p. 6; *Globe & Mail* (15 Jan 1994).

346. *CPP* (Dec. 1978), p. 15.

cylinders packed for correct impression, and cylinder positions adjusted for the thickness and compressibility of the new stock. Several steps were taken before and during the run to ensure that print quality met expectations. To prevent misregister the operator made precise measurements of the dimensions of images on the plate for comparison with the dimensions as they were printed on paper. They monitored the pH of the fountain solution, critical to proper plate dampening. To detect inking problems and the slurring and squashing of dots, they compared sheets as they came off the press against an approved sheet. If problems occurred they stopped the press to make adjustments. To accomplish these tasks, operators relied on their acquired skill, assisted by packing gauges, register rules, pH meters and densitometers, as well as colour blocks and various test marks printed on the margins of each sheet. In the 1980s, printers felt competitive pressure to produce shorter runs and reduce labour costs by lowering the down-time for make-ready or press adjustments. Manufacturers responded by offering automatic blanket washing and simplified plate changing and by automating many press operator functions. Increasingly, presses were equipped with plate scanners and on-line densitometers that relayed information to the operator who quickly made adjustments to inking, tension, register, fountain solution, or other elements at a remote control console. In addition, operators could pre-set ink, paper size, and impression controls for the next job while the current job was still running, thus saving time in the transition. In some cases, adjustments were made automatically, without operator input. Commenting on all the changes, one manufacturer said in 1990 that "more changes in press technology have taken place since 1985 than in the entire 1970s."[347]

One important element in offset lithography, the ink-water balance, was particulary difficult to remedy. At the beginning of each press run this had to be adjusted, at considerable cost in time, labour and wasted paper; wastage was sometimes as high as 500 sheets or several hundred feet of web. In the late 1960s 3M introduced a plate that promised to eliminate water from the printing process entirely. Its 3M Dry Plate was coated with a silicone that did not accept ink. Under UV light exposed areas released the coating to leave a bare metal printing surface in the image areas of the plate. Waterless printing began to attract attention in the 1980s. It required fitting a temperature control unit on the press and the use of more expensive inks and plates. But the technology allowed the use of finer screens and printed more intense colours with a glossier finish. Several Canadian printers were using the technology for high-quality work by the early the 1990s. Some industry observers predicted it would soon become the norm.[348]

Despite the advance of offset lithography, letterpress did not disappear overnight. In the late 1970s, for example, 55 per cent of printing plants in the United States still owned some letterpress equipment. And in 1984 17 per cent of work in North America was still done by letterpress and another 15 per cent by flexography. In addition to newspapers, letterpress was still common in the printing of labels and packaging and in imprinting and numbering items like cheques.[349]

Some attempts were made to adapt letterpress for competition with offset. In the 1960s photopolymer, or photorelief, plates were introduced. These consisted of a thin metal base overlaid with a layer of photosensitive plastic. After exposure under a negative, the plate was "etched" with a chemical that dissolved those areas of the plastic not exposed. The resulting plastic relief plate could then be used in several ways. It could be run flat on a cylinder press, or mounted as a "wrap-around" plate on a rotary letterpress machine. In addition, it could be mounted on the plate cylinder of an offset press. This "dry offset" or "letterset" method eliminated dampening, one of the most troublesome variables in lithographic printing. With production costs about one third less, photopolymer plates offered letterpress

347. *CPP* (Oct. 1973), p. 10; *CPP* (Dec. 1978), p. 15; *CPP* (May 1981), p. 17; *CPP* (Sept. 1981), pp. 89–92; *CPP* (Oct. 1981), p. 25; *CPP* (Feb. 1984), pp. 22–23, 31; *CPP* (Oct. 1984), p. 24; *CPP* (Feb 1987), pp. 26, 31–32; *CPP* (Sept. 1989), pp. 31–32; *CPP* (Jan. 1990), p. 32; *American Printer* (Sept. 1993), pp. 52–56. For general information on presswork before computers, see Strauss, pp. 178, 500–7, 514. For the period after, see Daniel T. Scott, *Technology and Union Survival: A Study of the Printing Industry* (New York: Praeger, 1987), pp. 44–45.

348. *CPP* (Dec. 1970), pp. 48–49; *CPP* (Sept. 1993), pp. 37–43; *American Printer* (Sept. 1993), p. 53.

349. *Graphic Arts Monthly* (Oct. 1990), p. 114; *CPP* (April 1984), p. 4.

printers a less-costly alternative to photoengraving, stereotyping and electrotyping methods of platemaking, one of their main liabilities in competition with photolithographic printers. Manufactured by several suppliers, including DuPont (Dycril), BASF (Nyloprint), Kodak (KRP) and W. R. Grace (Letterflex), photopolymer plates were used in Canada. For example, Pilgrim Offset Ltd. of Ottawa acquired the first Dycril outfit in Eastern Ontario and by early 1963 supplied plates to over ten printers in the Ottawa area. When made and handled by skilled operators, photopolymer plates could produce long, reliable runs at high speeds with superior ink transfer. Newspaper publishers unwilling to make the massive capital investment in offset often switched to photopolymer plates, which were compatible with the photocomposition systems they were adopting at this time. In 1975, for example, about 90 North American newspapers and 20 commercial printers were using W. R. Grace's Letterflex plates. Despite being useful in some applications, however, photopolymer plates did not stop the adoption of offset lithography in most commercial and newspaper press rooms.[350]

In the 1980s, some American newspapers began experimenting with flexography as an alternative to offset printing. Interest stemmed from the high capital costs of offset presses, which, due largely to their complex inking apparatus, proved to be as heavy and as expensive as letterpress units. Some publishers retrofitted their offset or letterpress equipment by installing simpler anilox ink rollers long used in flexography. Others installed actual flexographic presses to print all or part of the newspaper. Experimenters reported several advantages for the rubber plate system. Flexographic presses were, due to their simple inking arrangement, lighter and hence cheaper. For the same reason they were less noisy and consumed less power. Being less complex, they were also easier to maintain. Requiring no adjustments of ink and water at the beginning of press runs, they also wasted far less time and paper than offset. Another environmental consideration was that the water-based flexo inks eliminated the need for petroleum-derived solvents. Print quality was also improved in some respects. Unlike the oil-based offset and letterpress inks, flexo inks printed with little or no set-off or show-through, and readers found no ink rubbed off on their fingers. The final result was that flexo could print clean, vibrant colours, which advertisers were increasingly demanding. Some of the earliest flexo success, in fact, had been with colour comic supplements. Newspaper flexo still required technical improvements, related mostly to inconsistent results of the inks on newsprint. But by the end of the 1980s, about 35 American newspapers had converted part of their production lines to flexography. Manufacturers like MAN Roland and KBA reported increasing orders for their flexo presses. In 1991 Pacific Press, publisher of the Vancouver *Sun* and *Province*, installed perhaps the first flexographic news press in Canada.[351]

Computerized Typesetting

Changes in the pressroom were being matched by an even more profound transformation in the composing room. This ultimately resulted in the disappearance of hot metal linecasters and, what one print historian has called the final "dematerialization of the letter."[352] The change moved along two lines, initially parallel and finally converging: computer automation and phototypesetting. While computers were initially applied to any typesetting system, including hot metal, they eventually became synonymous with phototypesetting.

The use of computers in typesetting had been anticipated by the Monotype and TTS punched tape systems. In both cases, the input and output stages of typesetting were separated in time and space. The means of connecting the two was a punched paper tape whose coding stored all the information required to reproduce as type the original text without direct operator input. Of the two systems, the Monotype was more

350. *CPP* (Nov. 1958), pp. 45–47, 78; *CPP* (April 1960), p. 78; *CPP* (Jan. 1963), p. 123; *CPP* (Feb. 1963), pp. 40–41; *CPP* (July 1963), p. 22; *CPP* (June 1966), p. 48; *CPP* (Sept. 1966), p. 45; *CPP* (July 1975), p. 64; *Production Journal* (July 1984), p. 28. For general information, see: Strauss, pp. 220–21, 288–89; Field, pp. 383–84, 425.

351. *CPP* (July 1981), p. 18; *CPP* (Feb. 1984), pp. 21–22; *CPP* (Aug. 1984), pp. 48–49; *CPP* (Feb. 1987), pp. 25–26; *CPP* (June 1987), pp. 35–36; *CPP* (April 1990), pp. 16–18; *Professional Printer*, 27, 3 (1983), p. 15; *Production Journal* (July 1984), pp. 28–30; *Canadian Business* (March 1994), p. 48.

352. Alan Marshall, "A Typographer by Any Other Name," *Bulletin of the Printing Historical Society*, 35 (Autumn 1993), p. 1.

advanced because its tape also carried line justification codes. These were input by the compositor, who was aided by a mechanical counter/calculator unit on the keyboard (the TTS system depended for justification on the spacebands of the linecaster itself). In terms of justification, a computer did nothing that the Monotype system did not do. It adjusted the width of each word space by dividing the unfilled line length by the number of word spaces and adding the quotient to the width of the word spaces to be composed. Far more complicated was the task of word division, or hyphenation, at the end of a line. For this reason, hyphenation remained an operator function on many systems long after justification was automated.

Even before computers, tape operation was applied to other typesetting methods. In "strike on" typesetting the Friden Flexowriter and Justowriter systems were popular in the 1960s. Like the VariTyper, these were typewriters adapted for typesetting. But by storing keystroke information on tape they eliminated the need for a manual retyping to achieve justification. They consisted of two units, one a keyboard where the operator typed the original copy, producing a justified paper tape and a typed paper proof or "hard copy." The second unit was another keyboard which received the coded tape and produced justified galleys of type on paper or duplicator plates at a rate of 100 words per minute. Justowriters were popular among Canadian weekly and small daily newspapers who had converted to offset printing. Not only could they be operated by low-paid typists rather than compositors, but they could receive news wire material via the telecommunications network. Among those using the system in the early 1960s were the Guelph *Guardian*, Prince George *Citizen* and *La Voix de l'est* (Granby), all dailies, and several rural and suburban weeklies.[353]

In 1966 IBM introduced its Magnetic Tape Selectric Composer (IBM MT/SC). This system, owing to its great capabilities, soon became the most popular strike-on composing system in the industry. Like the Justowriter, the IBM MT/SC consisted of separate input and output units. An operator at the "recorder" created a typed hard copy and a coded magnetic tape. The machine automatically gauged and adjusted word spacing for justified right margins and encoded this information on the tape. If the operator made an error during typing he or she could backspace and retype, automatically erasing and recoding that portion of the tape. Moreover, the tape could be removed and stored then placed back on the keyboard for review and further editing. Such typographic formatting as line width, line spacing, indentations and quadding was performed at a separate control console. This console also allowed the "merging" of two tapes into a single text. Output on the IBM "composer" reached a speed of 14 characters a second. An additional attraction of the IBM system was that unlike the Justowriter, in which typefaces were limited to one per machine, the composer's "golf-ball" typehead system allowed the interchanging of fonts within a single line.[354]

The IBM MT/SC was an important transitional device in the evolution of computerized typesetting. With the early punched tape systems the operator still made most end-of-line decisions, though justification was semi-automated. On the IBM MT/SC not only was justification fully automatic, but the system contained a hyphenation logic routine that split words at line endings according to programmed rules of word division. In many respects, the IBM MT/SC's capabilities for revision, tape merging, justification and hyphenation made it a forerunner of word processing. The provision of a control console separate from the input terminal reinforced within typesetting development the growing separation of the initial typing/encoding/input of copy from specifically typographical functions.

This division was also evident as printers and publishers in the 1960s began to apply computers to their conventional hot-metal typesetting systems. In 1962 the Mergenthaler company introduced its special purpose Linasec computer (later sold by Compugraphic), which could accept an unjustified TTS paper tape and produce a justified and hyphenated tape at a rate of one line per second. On this machine a monitor was required to input end-of-line hyphenation when prompted by the computer. Also in 1962 RCA announced that its general purpose RCA 301 Data Processing System could be adapted to receive raw tape and produce justified and

353. *CPP* (Dec. 1960), p. 69; *CPP* (May 1963), p. 29; *CPP* (Nov. 1964), p. 54; Strauss, pp. 99–100; Field, pp. 106–7.

354. *CPP* (Nov. 1966), p. 14; Strauss, p. 148; Field, p. 208.

hyphenated output. Soon after, another computer builder, IBM, announced that its IBM 1620 could also be programmed to perform typesetting functions. "Typesetting," wrote a *CPP* correspondent in July 1964, "is moving into the computer age." In that year, no fewer than 11 manufacturers were selling computers to the printing and publishing industry. By the end of 1966 this number had increased to 19. Perhaps the most important new machine was Digital Equipment Corporation's PDP-8 minicomputer, which in a few years became a vital component in many automated newspaper typesetting systems.[355]

Computers proved especially popular among newspaper publishers, who saw in them a means of reducing composition costs dramatically. By eliminating virtually all end-of-line operator judgement, computers enabled typists perforating raw tape to produce 25–40 per cent more than compositors punching standard TTS tape and far more than those operating linecasters directly. In addition, some computers automatically allotted output to linecasters to ensure all were kept operating continuously, thus enabling fewer machines to be used more intensively. At the end of 1966, Canadian printers were operating 26 computers. Of these, 11 were IBM machines, either the 1620 or the newer 1130, and 8 were Mergenthaler Linasecs. Since 1965 the Government Printing Bureau in Hull had been using a Univac 1050 computer in conjunction with 14 tape perforators and 6 Elektron linecasters to produce *Hansard* and other parliamentary publications. Pioneers in newspaper use were the Quebec City newspapers *Le Soleil* and *L'Évènement* which in 1965 began producing type on Monarch linecasters through the use of two Intertype 318 computers and nine TTS keyboards. The publisher reported the scrapping of 11 linecasters, the elimination through attrition of 12 compositors, and a substantial drop in overtime wages. Most large daily newspapers began to adopt computers in the late 1960s, and by 1980 most were using them for news and classified advertising composition as part of integrated, on-line editorial systems with multiple keyboards. The introduction of computers threatened the skills and jobs of compositors. As early as 1964 computers were the main issue in a newspaper strike that devastated the Toronto Typographical Union. This will be discussed later in this chapter.[356]

These early applications of computers to typesetting highlighted both their capabilities and the points in the production process that undermined them. On the one hand, copy input was still a redundant process, wherein writers and reporters typed an original that had to be retyped for input into the computer system. And while the processing of tape took mere seconds, modern, continuously operating linecasters like the Intertype Monarch and Mergenthaler Elektron could manage no more than 14 to 15 newspaper lines per minute. The first problem was addressed by a variety of computer editorial and document processing systems that became popular in the 1970s (see below). The second problem, of typesetting itself, was resolved by the perfection of new, rapid phototypesetting systems.

Phototypesetting: The Second Generation

In the late 1950s manufacturers introduced several phototypesetting machines that were to have a lasting impact on the graphic arts industry. Later dubbed "second generation" phototypesetters, these were built on entirely different principles than the hot-metal patterned Fotosetters and Monophotos. The machine that pioneered the principles of second generation phototypesetters was the Photon. Invented in 1945 by two French engineers, René Higonnet and Louis Moyroud, it featured a typewriter keyboard, a photo unit, a spinning master negative disk, and an electromechanical memory register and counter unit to automatically perform justification. A high speed flash exposed a selected character at the instant that portion of the disk passed through the photo unit. Higonnet and Moyroud moved to the United States and introduced their machine to the North American printing industry in 1949. It remained in development until late 1955, when the Photon 200 was introduced commercially.

The success of the Photon 200 was soon followed by Mergenthaler's Linofilm, and American Type Founders' ATF Typesetter. Like the Photon

355. *CPP* (July 1964), p. 34; *CPP* (Aug. 1964), pp. 30–31; *CPP* (July 1966), pp. 47–48; *CPP* (Dec. 1966), p. 7; *CPP* (Sept. 1973), p. 106; Kelber & Schlesinger, pp. 110–11, 167–73; Phillips, pp. 55–81; Wallis, *Concise*, pp. 33, 35, 37.

356. *CPP* (Feb. 1966), pp. 27–30; *CPP* (June 1966), pp. 49–50; *Kent Commission*, pp. 183–84; Phillips, pp. 58, 64–65.

both employed a standard typewriter keyboard and a combination of electrical or electronic and mechanical methods to select and expose characters. Unlike the Photon, these two machines employed punched tape for input, code storage and justification. Owing to the success of punched tape operation, which allowed for input from several keyboards and thus increased their output, Photon introduced the 540 in 1962. Both the Photon and Linofilm had easily changed fonts and lens arrays that allowed for diversity in type styles and sizes. This made them very attractive for display composition, an attribute that second generation machines retained into the 1980s. The ATF Typesetter, which featured only two fonts per disk and required a different disk for each size, was an inexpensive machine intended for text work.[357]

Perhaps the earliest second-generation installation in Canada was at the Calgary *Albertan* in 1957. That paper installed two Photons, which it used primarily for setting advertisements and flyers. It was still using a Photon in 1966, claiming increased versatility and substantial savings in time and money over hot metal methods. In 1959 Montreal trade typesetters McLean Bros. installed the first Linofilm in Canada. That firm too was pleased with the flexibility of the system as well as the clarity of reproduction. In 1960 the Toronto *Star* introduced three Linofilm keyboards and a photo unit to set rotogravure sections of the *Star Weekly*. In addition to this text work, the Linofilm was also used to set display ads for the daily *Star* and to produce a variety of job work.[358]

From the mid-1960s onward the capabilities and variety of second generation machines expanded greatly while the cost of the least expensive machines plummeted. Gradually, the maximum speeds of second generation machines increased so that by 1981 they were capable of anywhere from 20 to 150 newspaper lines per minute; most fell into a middle range of 25 to 60. Several new manufacturers entered the field. In 1968 Compugraphic introduced the simple but well-engineered CG 2961 and CG 4961, whose prices of less than $10,000 astonished the industry and did much to popularize phototypesetting. In 1957 the Calgary *Albertan* had paid $75,000 for each of its Photon 200s, and in the mid-1960s most machines still cost more than $80,000. Sales of phototypesetters exploded in the early 1970s; in 1975 82 per cent of all machines had been purchased in the previous three years. Sales were dominated by simple, inexpensive machines, exemplified by the budget-priced products of Compugraphic. Some buyers were daily newspapers like the Toronto *Sun* and the Niagara Falls *Review*. But many small printing firms acquired typesetting capabilities for the first time. So complete was the rush to phototypesetting that by 1975 an industry expert told Canadian printers that "the noble linecaster is a dead duck." In 1972 manufacturers shipped 55 hot metal machines and 4100 text phototypesetters. Strike-on systems were also eclipsed. In 1970 manufacture of the Justowriter ceased and in 1978 VariTyper production was discontinued.[359]

Through the 1970s and 1980s, the input end of phototypesetting technology converged with the emerging fields of word processing and personal computing. Beginning in 1970, when Mergenthaler introduced the Linofilm VIP, manufacturers installed computer front ends on new phototypesetters to replace hard-wired logic circuits for end-of-line functions and typographic formatting. Led by Compugraphic with its CompuWriter in 1971, manufacturers reverted to direct input for their inexpensive lines. Magnetic floppy disks, meanwhile, supplanted paper tape for input and data storage on the faster second generation devices like the Harris Fototronic. These were later added to the budget priced machines. After Addressograph Multigraph introduced the Comp/Set 500 in 1974, more and more machines were equipped with video displays. Soon combined with record and playback from floppy disks, operators could edit on the

357. For technical details of the three systems see: *CPP* (Dec. 1951), p. 36; *CPP* (July 1956), pp. 34–35; *CPP* (April 1958), pp. 65, 80; *CPP* (Aug. 1958), pp. 44, 56; *CPP* (Dec. 1959), back cover; *CPP* (May 1966), pp. 43–46; *CPP* (Sept. 1966), pp. 192–94; Strauss, pp. 100–13.

358. *CPP* (June 1959), pp. 77, 84; *CPP* (Nov. 1959), p. 61; *CPP* (Feb. 1960), p. 5; *CPP* (Aug. 1960), pp. 41–42; *CPP* (May 1966), pp. 49–50; *Linotype News*, 3 (1961), pp. 4–5.

359. *CPP* (Jan. 1973), p. 17; *CPP* (Feb. 1973), pp. 25–26; *CPP* (Sept. 1973), p. 106; *CPP* (Feb. 1974), pp. 45–47; *CPP* (Dec. 1975), pp. 22, 25; *CPP* (June 1976), p. 20; *CPP* (Oct. 1978), pp. 21–22; *CPP* (Jan. 1981), pp. 24–25, 28; *CPP* (Aug. 1984), pp. 27–29; *CPP* (Feb. 1987), pp. 33–34; Field, pp. 212, 216; *American Printer* (Jan. 1983), p. 56; *Typeworld* (20 June 1986), p. 10; Wallis, *Concise*, pp. 37–58.

screen before sending the job to the photo unit. Second generation phototypesetters reached maturity in 1977 when Compugraphic released the Editwriter 7500. This machine incorporated all the major developments to date: a direct input keyboard, a video screen, floppy disk record and playback for editing, and a low price. Using two Intel 8080 microprocessors, it also allowed the operator to input and edit one job while the photo unit was processing another. The Editwriter 7500 was, in the words of one industry observer, "a complete text processing system" and the most popular phototypesetter of all time. Any further changes, he added, would require a fundamental change in technology.[360]

This change was already underway. In 1984, 80 per cent of phototypesetting machines were second-generation devices;[361] they dominated the "low end" of the equipment market. But the "high end" was served by a fundamentally new technology, digital typesetters first introduced in the 1960s. These machines were even more compatible with computers.

Digital Typesetting: The Letter Dematerializes

In 1970, the federal Department of Agriculture reported a new method of publishing the annual report of its Research Branch. A typist at a keyboard at the Central Experimental Farm in Ottawa keyed in the text and composition instructions. These were conveyed across town by a phone-line connection to a computer at Alphatext Systems Ltd. Here the computer composed the report page by page on a cathode ray tube according to digital character instructions. The tube display was photographed automatically and negatives sent to the Government Printing Bureau for offset platemaking and printing. The Department reported that this computer text processing system nearly halved the cost and cut one month off the production time for the annual report.[362]

The use of digitally encoded fonts and CRT character generation was a phenomenon of the late 1960s, a response to the growing use of computers for data processing and storage. Computer data bases contained millions of words of useful information not easily transformed into print. To retype this information on a typesetter keyboard was expensive. Computer printouts could be photographed and printed offset, but the typographical results were poor. Hot metal machines and second generation phototypesetters could be fed computer output tape, but their speed was much slower than that of the computers themselves. The solution to this bottleneck was to abandon mechanical and electromechanical devices in favour of purely electronic forms of character selection and generation. Television and computer displays had long used CRTs to compose visual images from encoded electronic signals. In the 1960s, research was initiated by typesetting and computer companies to apply these principles to the typesetting of vast, periodically revised databases like telephone directories, catalogues, and encyclopedias. The first commercial models were released in 1967.[363]

A CRT typesetter generated characters by "painting" them in a parallel series of vertical or horizontal strokes from an electron beam scanning the face of cathode ray tube. The on and off action of the beam corresponded to the black and white areas of the character and was controlled by a signal from the unit's computer. Some machines scanned one letter at a time, others one line, and the fastest and most expensive entire pages. Two of the first CRT machines, the Mergenthaler Linotron 1010 and 505, stored character masters on photographic grids, from which characters were scanned and generated. The Linotron 505 was the first CRT machine to have a major impact on the printing industry. About 200 were installed by large newspapers and commercial printers before production ceased in 1973.[364]

Other machines released in 1967 and shortly after, the RCA Videocomp (based on the German Digiset), the Alphanumeric APS-2 and the Harris-Intertype Fototronic-CRT, stored character descriptions in digital computer memory. This method marked the line of future development. Digital storage of character descriptions, provid-

360. *Typeworld* (20 June 1986), pp. 14, 18, 20, 22.
361. *CPP* (Aug. 1984), p. 29.
362. *CPP* (Oct. 1970), p. 44.
363. *CPP* (Aug. 1967), pp. 25–27.
364. Information in this an following paragraphs from: *Graphic Arts Monthly* (June 1981), pp. 39–42; *Typeworld* (20 June 1986), pp. 8, 10, 14, 18, 22. See also: Field, pp. 217–18; John Negru, *Computer Typesetting* (New York: Van Nostrand Reinhold, 1988), pp. 124–25; Charles Bigelow & Donald Day, "Digital Typography," *Scientific American* (Aug. 1988), pp. 106–119.

ed the computer had a large memory, gave instant access to hundreds of fonts. And because the characters were digital bits and not physical entities, they could be easily modified electronically to produce condensed, expanded, italic, or distorted letters. But initially the large amount of computer memory these machines required made them far too expensive for applications outside of specialized data base work. Also due to memory restrictions, font selection was limited and image quality (resolution), determined by scan lines per inch, was unsatisfactory in certain sizes.

In the 1970s prices on digital machines fell to levels making them commercially accessible. In 1970 Autologic released the APS-4, the first digital machine available at a "popular" price ($146,000). In 1972 MGD Graphic Systems introduced the Metro-Set, a machine that successfully commercialized the digital storage of characters as outlined shapes. By storing the information as vector (lines) rather than raster (dots) data, less memory was required and image resolution for all type sizes was more uniform. According to one industry observer, the APS-5, released in 1975, became "the standard for newspaper typesetting around the world." Priced at just $80,000, it could produce 3000 lines per minute. At the end of the 1970s, CRT digital typesetters finally fell to a price accessible to many newspaper, printing and typesetting houses. In 1978 Mergenthaler introduced the Linotron 202, which at a price of less that $50,000 became "a runaway bestseller overnight." It was the first machine to take advantage of inexpensive microprocessors. The Linotron 202 was soon followed by other microprocessor-based machines at similar prices, the Compugraphic 8600, the APS Micro-5, the Itek Mark VII and others. In 1979 a new level was reached with the release by Mergenthaler of the CRTronic, a desktop, direct entry machine that, at $17,000, was competitive with second-generation phototypesetters. While its speed was only 40 lines per minute, its resolution was as good as the best CRT machines. By 1981 Mergenthaler had sold 2,000 CRTronics worldwide.

Just as CRT typesetters were finding wide distribution in the graphic arts industry a new generation of digital machines based on lasers emerged. Laser typesetters functioned in a similar way to their predecessors. But in place of an electron beam-CRT arrangement, a laser fired a high intensity beam of light directly onto paper. Rather than generate individual characters or lines, laser typesetters scanned entire pages, building up type and images areas as complex mosaics of pixels (picture elements). The laser's action was controlled by a software program, a Raster Image Processor, that converted coded data into a raster pattern of lines. Laser typesetters produced a sharper image and at higher speed than CRT typesetters. The extreme intensity of laser light also allowed the machines to set directly on a sensitized printing plate. Laser machines were also more flexible, able to compose rules, tints, and line and halftone graphics as easily as type. In the 1980s manufacturers dubbed these machines "imagesetters."

Monotype International announced the first laser typesetter, the Lasercomp, in 1976. It was followed, among others, by Linotype's unsuccessful Omnitech 2000 (1979) and very successful Linotronic 300 (1984), and Compugraphic's CG9600 (1986). But laser typesetting developed slowly, partly due to the expense and fragility of lasers but also because the output of high resolution pages of type and graphics depended on the input of fully made-up pages. This capability only slowly evolved through the 1980s as software and graphic scanning hardware came on the market. In 1990 laser machines and similar devices employing light emitting diodes (LEDs) were becoming the new standard in the graphic arts industry. In addition to typesetters, lasers achieved great success in the electrostatic (xerographic) printing of computer output. By 1990 laser printers were common features in office, desktop publishing and personal computer systems, albeit at lower resolutions than accepted in the graphic arts.[365]

Scanners

As typesetting machines evolved into laser imagesetters, the technology converged with another that had been developing for several decades in the production of pictures: electronic scanning. Since the turn of the century, scanning had been used for the facsimile transmission of photographs over the telecommunications network. The principles of facsimile scanning

365. *CPP* (May 1987), p. 2; *CPP* (June 1987), p. 36; Wallis, *Concise*, pp. 57–75; *Typeworld* (20 June 1986), pp. 18, 20; *Graphic Arts Monthly* (June 1981), pp. 42–44; L. W. Wallis, "Monotype: The Long Slippery Slope," *Printing Historical Society Bulletin*, 33 (Winter 1992), p. 4.

were applied to graphic arts work after World War II. Like facsimile, these systems employed a light beam and a photosensitive electric cell to scan an original image in a series of lines. The photo-cell reacted to tonal variations in light reflected by the image by modulating an electrical current. The resulting variable signal was amplified and used to control a variety of output devices.[366]

The first commercial application of electronic scanning was in the production of halftone engravings for the letterpress industry. In these machines, the modulated and amplified electrical signal was used to control a stylus that engraved a dot pattern in a plastic or metal plate. The two best-known devices used in Canada were the Fairchild Scan-A-Graver and the Hell Klischograph. Both were developed into a complete line of machines with a range of special features. The Scan-A-Graver was developed in the United States and introduced to the printing industry in 1947 or 1948. Although Canadian printers were aware of developments as early as 1947, the first experimental use of the devices seems to have occurred at the London *Free Press* in 1949. During the 1950s and 1960s Fairchild and Hell machines, as well as other makes like the Crosfield Scanatron and the Photolathe, were installed in scores of Canadian printing plants. By 1957 about 150 were in operation. The machines proved especially attractive for weekly and non-metropolitan daily newspapers, establishments too small to have their own photoengraving departments. The machines allowed these papers to produce their own cuts without frustrating delays on late-breaking news stories at a cost less than or comparable to service from photoengraving houses. In 1957 the London *Free Press* was producing virtually all their own engravings on three Klischograph and two Scan-A-Graver machines. Dozens of Klischograph users could be found across the country, from the Courtney *Argus* to the St. John's *Evening Telegram*. Even more were leasing Scan-A-Gravers. Large metropolitan dailies were less inclined to use electronic engravers, both because it proved impossible to produce stereotype mats from plastic plates and because their engraving requirements demanded a daily volume of cuts far beyond the capacity of the machines.[367]

The modest success of electronic engravers was overshadowed by the introduction of scanners for colour separation and colour correction in the 1950s. As discussed in Chapter 2, four-colour process printing is based on the production of four separate negatives and printing plates that together will produce a composite, full colour image. Colour correction in the graphic arts has always been necessary, primarily because the three process colour inks—yellow, cyan and magenta—are "impure." The cyan and magenta inks, for example, contain unwanted yellow that reduces the colour fidelity of any printed product. Colour correction of the yellow negative reduces the yellow in those areas where cyan and magenta are to be printed. Historically this was a laborious hand process called dot etching, in which an artist reduced the size of yellow halftone dots by the brush application of chemicals. Less labour intensive was the masking method which came into use after World War II. In this system, colour balance was achieved by applying coloured masks to areas of the appropriate separation negative to reduce the amount of light passing through. While cutting the correction time for a set of four negatives from 40 hours to one or two, colour correction remained an operation requiring great care and technical skill.[368]

Electronic scanning and colour correction eliminated most hand work and masking. A basic colour scanning system consisted of three units. A scanning mechanism collected information about the colour composition of the original. It generated a signal for each colour by splitting the light from the image into three colours, each of whose varying values stimulated a photocell, producing three modulated electrical signals. These signals passed to the second unit in the system, a computer that modified them according to instructions from the operator. This modification adjusted the colour values represented by the signals. The processed signals finally passed to the third component, a film scanning unit where the electrical signal activat-

366. For a brief history of facsimile in telecommunications see Charles R. Jones, *Facsimile* (New York, Rinehart, 1949), pp. 1–23.

367. *CPP* (April 1947), p. 48; *CPP* (Feb. 1950), pp. 21, 43; *CPP* (May 1956), pp. 7, 63, 74; *CPP* (April 1957), pp. 48–54; 71; *CPP* (Nov. 1959), p. 62; *CPP* (Feb. 1963), p. 38. See also Strauss, pp. 223–24.

368. For a technical discussion of colour reproduction and correction see Field, pp. 346–55.

ed a light source to expose photographic film to produce each of the corrected yellow, cyan, and magenta negatives.[369]

The first colour scanners were introduced in the 1950s, though they were developed as early as 1937 by Eastman Kodak and the Interchemical Corp. (an ink manufacturer). Around 1950 Time-Life introduced the Time-Life (PDI) Scanner, which obtained colour corrected separation positives from an original colour transparency. The Time-Life machine was very expensive and was not sold directly to the printing trade. Instead, Printing Developments Incorporated (PDI), a Time-Life subsidiary, opened service studios in major printing centres. In 1956 none were operating in Canada, though several printers contracted for American services through a Toronto agent. By the end of the 1950s several other manufacturers in the United States and Europe were producing colour scanners. These included the Fairchild Scan-A-Color (U.S.), Hell Vario-Klischograph and Colorgraph (Germany), Crosfield Scanatron (U.K.), Hunter-Penrose Autoscan (U.K.), and the Belin scanner (France). These machines had a variety of capabilities, some builders offering several models. Some produced from separation negatives, others from colour transparencies, others from colour prints. Some scanned the copy and exposed the film on a rotating drum, others on a reciprocating flat bed. Some could not enlarge or reduce, others could. Most produced film positives or negatives but some, like the Vario Klischograph, could engrave relief plates. Some machines produced all colour separations simultaneously but others did one at a time.[370]

Due to their high price and effective cost competition from colour correction by masking, colour scanners spread very slowly. The 1964 census of 1400 Canadian printers revealed less than 200 electronic engravers in use. Virtually all of these would have been Scan-A-Gravers and similar machines, not colour scanners. In 1958, Legg Bros. of Toronto had installed the first F-162 Klischograph in North America. This device produced uncorrected, four-colour plates at half the price of photo-engraved cuts. Designed for fast, 3–4 day turnaround, these plates produced "acceptable colour." In 1961 both the Toronto Star and Murray Printing & Gravure installed Crosfield Scanatrons to produce corrected positives to make rotogravure plates. In 1960 the *Star Weekly* had used Scanatron positives to print a full colour picture of a royal wedding just 48 hours after the event. Through the 1960s, however, scanners remained expensive machines suited only to high volume use by a few publishers and trade houses. Even in the huge American printing market, only about 100 plants were using scanners in 1972. Nevertheless, about one quarter of all colour separations were done electronically.[371]

In the 1970s builders greatly increased the speed and capability of their scanners. Digital computers and data storage supplanted analog devices, greatly increasing the flexibility of the systems by making it easier to manipulate data collected by the scanner. The most advanced of the new generations of scanner were the Crosfield Magnascan 550 and the Hell (HCM) DC300 and DC3000. The first of these machines began appearing in Canadian plants in early 1973. By 1975 12 DC300s had been installed in Vancouver, Montreal and Toronto. These machines were generally too expensive for medium-sized plants. But manufacturers also introduced smaller scanners with more basic features geared to these firms. By the early 1980s sales of colour scanners were booming. In 1984 Crosfield increased its sales 3–4 times over the previous year. Much of this was attributed to the increasing use of colour by newspapers. But of the 1700 scanners then in North America, the majority were found in large trade shops. About 350 of these firms did 70 per cent of all colour separations in North America. By 1987 trade houses were doing 75–80 per cent of separations. By this time, however, up to 40 per cent of scanners were in other hands.[372]

369. Field, p. 359; *Printing Magazine* (Nov. 1972), pp. 35, 37.

370. *CPP* (Feb. 1950), p. 22; *CPP* (June 1950), p. 47; *CPP* (June 1951), p. 30; *CPP* (Oct. 1956), pp. 42–43; *CPP* (Nov. 1956), pp. 96, 98; *CPP* (June 1957), p. 56; *CPP* (Feb. 1960), p. 49; James Walter Burden, *Graphic Reproduction Photography* (New York: Hastings House, 1973), pp. 404–10; Strauss, pp. 163–64.

371. *CPP* (April 1958), p. 62; *CPP* (June 1960), p. 57; *CPP* (March 1963), p. 54; *CPP* (Sept. 1970), p. 106; *CPP* (March 1973), p. 46; *Printing Magazine* (Nov. 1972), pp. 33, 35.

372. *CPP* (March 1973), pp. 45–47; *CPP* (May 1973), p. 33; *CPP* (Aug. 1973), p. 4; *CPP* (Nov. 1975), p. 5; *CPP* (June 1981), p. 10; *CPP* (March 1984), p. 10; *CPP* (April 1984), p. 21; *CPP* (Feb. 1987), p. 26; Field, pp. 360, 364.

Among the features of most new machines, from the simplest to the most elaborate, was the ability to produce film positives or negatives in a variety of sizes. This made it possible to work from 35 mm originals and to eliminate a camera step. In addition, the new systems generally were able to produce screened negatives or positives. Previously, scanner-produced output had to be screened photographically before plate-making. Initially, scanners produced halftones via a contact screen laid over the film in the exposure unit. But the more sophisticated machines instead utilized electronically generated dots controlled by the digital computer. These were exposed on film by lasers, producing halftones superior in fine detail to the best photographic screened negatives. Finally, the more sophisticated new scanners offered unparalleled power to alter and create images. To aid in all these processes, manufacturers began to offer video monitors for use with their machines. Local colour changes—say, in the dress colour of a fashion model—could be made. Background tones could be added. A figure from one transparency could be scanned and inserted in proper scale into another. By 1980 on some machines, text and images from several sources could be scanned and composed as complete pages on film. As with laser typesetters, this technology began to be fully explored in the 1980s.[373]

Electronic Pre-Press

The conversion of both text and images into digital data was accomplished in the 1970s. The 1980s saw the increasing integration of text and graphics electronically, displayed on a video screen, and made up into complete pages. The printed page was transformed into a mosaic of dots, whose location was mapped and encoded in digital form and could be changed almost at will. This meant great flexibility in modifying type and images, easily revising material for a new printing, and even imprinting variable information within a press run. The term "electronic publishing" came into popular use at this time, though the definition of this term was imprecise. A good working definition, however, was emerging by the end of the 1980s:

> *... the digital storage, manipulation, transmission, and presentation of information. This information is organized in the form of a structured document that can be produced as hard copy or electronically displayed. These documents can include information in the form of text, images, or computer-generated graphics.*[374]

Electronic display of documents was seen by some as a potent rival for the graphic arts, which were perceived to be hidebound remnants of the industrial era. But what is most striking in the period ending in the early 1990s was the extent to which printing technology incorporated and was transformed by the same electronic technology. This occurred both in the preparation of the image carrier, and in the final transfer of the image to paper or other media.

During the 1980s, the "front end" of the production process was fully enclosed in a computer system. The range of systems launched by manufacturers was bewildering, ranging from the simplest desktop publishing arrangements to graphics work stations to complicated networks and colour pre-press systems. The main functional, as opposed to commercial, distinctions between them were based on degrees of speed, storage, resolution (display and output), and interconnection. In essence, different systems evolved to handle different documents. Simple systems could handle short personal documents, with text from one source and with one or few levels of editorial and design decision making. More complex systems were required for large, complex documents like newspapers: from multiple contributors, with text, graphics and photos, and multiple points of design and editorial decision making.[375]

Perhaps the landmark printing and publishing event of the 1980s, at least in public perception, was the launching by Apple Computer Corp. in 1985 of "desktop" publishing. That same year, *Canadian Printer and Publisher* published its first *Electronic Publishing* supplement. The Apple system featured a personal computer, an inexpensive laser printer, and user-friendly page makeup software. With this set-up one person at home or in the office could produce a complete document

373. *CPP* (March 1973), pp. 45–47; *CPP* (May 1973), p. 33; *CPP* (Aug. 1973), p. 4; *CPP* (April 1975), pp. 47–48; *CPP* (Jan. 1978), p. 4; *Printing Magazine* (Nov. 1972), pp. 35–37, 42; Field, pp. 360, 364.

374. Michael B. Spring, *Electronic Printing and Publishing: The Document Processing Revolution* (New York: Marcel Dekker, 1991), p. 50.

375. Ibid., pp. 32–33, 127.

ready for reproduction. Apple and its Macintosh computers enjoyed a monopoly in the desktop field for about two years, before page makeup software for IBM machines was introduced. The Mac remained, however, the standard in the graphic arts industry.[376]

At the heart of desktop publishing was an inexpensive personal computer built around a microprocessor chip. These machines were equipped with a variety of software to create original text and graphics. More importantly they featured page makeup software, the most common being "PageMaker" and "Ventura Publisher." To this input arrangement could be added an inexpensive, monochrome desktop scanner, another innovation of the 1980s, for the production of low-resolution halftones. For output a laser printer like the Apple LaserWriter and the Hewlett Packard LaserJet could produce a low-resolution output that emulated that of a phototypesetter. But more importantly, a page description language like "PostScript" translated the data files into a format that could be recognized by a wide variety of laser imagesetters. Thus desktop systems could be used to drive imagesetters with much higher resolutions than available on laser printers.

Ironically, desktop publishing was quickly adopted by graphic arts professionals. As early as 1987 several Toronto firms were operating as "service bureaus" for electronic publishing users, accepting files on tape, disk or by data transmission and designing and printing the final product. Weekly newspapers also adopted desktop. The Souris (Man.) *Plaindealer*, for example, acquired in 1987 a Mac Plus and a LaserWriter Plus to produce camera-ready, albeit low resolution, pages on coated paper. The personal computer has become in the early 1990s the standard input device for all levels of pre-press system from the simplest to the most complex.[377]

There was nothing revolutionary in desktop technology. All the elements were already in place and had been connected before. But they had been connected in much more expensive configurations useful only to professional printers and publishers. Newspapers pioneered the use of computer editorial and page makeup systems. In the early 1970s Canadian dailies began to install video display terminals for text entry and editing in news rooms and classified ad departments. These were linked in a network with one or several host computers that also commanded the operation of phototypesetting machines. Soon an editor could input format codes for type size and style, line length, etc. for individual articles. In this way some composition functions were removed from the composing room to the editorial office. By 1980, virtually all large Canadian daily newspapers were using computerized editorial systems with VDTs. As well, they used computers to lay out classified advertising. In the mid-1970s terminals for making up display ads had been introduced, among the first being the Harris 2200. In the same period, the first fully electronic page makeup systems were announced by Optronics International (the Pagitron) and Mead Corp. Despite the optimism they engendered, in 1980 only four dailies were able to make up all or part of an advertising page on the screen and none could display and edit an entire news page.[378]

Fully electronic page makeup was slower to evolve because it required sophisticated raster image processing software and a great deal of computer processing and storage in order to manipulate all the digital information contained in a page of type and images. Even after it became possible to make up the text elements electronically, the huge amounts of data embodied in screened photographs required that they be processed separately and stripped into the production negative before platemaking. Full electronic capabilities evolved in the 1980s as newspapers invested in colour scanners and other hardware. But as late as 1987 full pagination was unattainable. In the early 1990s, however, full page makeup seems to be becoming a reality. In 1990 Ottawa's *Le Droit* installed a system that featured PC work stations tied to central processors, offering more flexibility than the older terminal-host networks. This was the direction that other newspapers are expected to take.[379]

376. Ibid., pp. 125–28.
377. *CPP* (Jan. 1987), pp. EP-3–7; *CPP* (March 1987), pp. 16–20; *CPP* (Sept. 1987), p. 4. See also the Apple Macintosh ad in CPP (Jan. 1987), pp. 11–22.
378. *CPP* (June 1970), p. 15; *CPP* (Feb. 1973), p. 48; *CPP* (Feb. 1975), p. 23; *CPP* (March 1975), p. 7; *CPP* (June 1975), p. 28; *CPP* (Nov. 1975), p. 32; *CPP* (Feb. 1978), p. 48; *CPP* (April 1978), p. 57; *CPP* (July 1978), p. 25; *Kent Commission*, p. 184; Field, pp. 196, 235.
379. *CPP* (June 1987), p. 36; *CPP* (July 1990), pp. 42–44; *Le Droit* (23 mai 1990); Field, pp. 235–36, 246.

In the early 1990s newspaper systems were beginning to merge with colour pre-press systems (CEPS), which emerged out of the colour scanner field during the 1980s. What distinguished these systems, apart from their high cost, was their ability to manipulate high-quality colour images and combine them with text in a complete page. They typically featured colour and monochrome scanners, video work stations for retouching and cropping scanned images, Macintosh computers for manipulating text and laying out pages, and extremely capable laser imagesetters for film output. All elements in the system were linked by a wire or fibre optic local area network (LAN). Two notable examples of colour pre-press systems were installed in 1992–93 at Prodigy Graphics ($2.5 million) in Mississauga and Maclean Hunter ($1.2 million) in Toronto.[380]

Electronic Printing

As the front end moved toward fully electronic page make-up, changes were also occurring in the actual printing operation. Two alternative directions were evident. One was to modify offset printing technology, either in the method of making the lithographic plate, or by adapting xerographic or laser printer principles to offset. This method, typified by computer-to-plate systems, retained the traditional orientation of printing toward fixed images. The second trend was to use printing methods originally devised for computer printers, specifically ink jet and laser printers. These devices were found useful for the production of variable images.

Computer-to-plate systems were devised to eliminate the paste-up, camera, and stripping stages that long preceded plate-making. Since the early 1960s, it had been possible to produce offset duplicator paper plates by direct-imaging in a special camera/platemaking unit. In addition, the Hell Klischograph machines mechanically engraved letterpress plates or gravure cylinders from scanned originals or film. In the 1970s, laser devices were introduced to expose plates from scanned paste-up originals. As early as 1975, lasers were being used to expose photopolymer plates for letterpress newspaper printing. A few years later, two American companies, EOCOM and LogEtronics, introduced laser devices that produced a metal lithographic plate from a scanned paste-up.[381]

True computer-to-plate systems were developed in the 1980s, in parallel with the growing ability to compose complete pages on the computer screen. Gravure cylinder preparation was greatly aided by direct engraving from digital image data. Scanner manufacturers Crosfield and Hell (HCM) developed alternatives to stylus engraving on copper. In 1987, Batten Gravure Cylinders of Toronto became the first firm in North America to install a Crosfield Lasergravure Packaging System. This system used a direct digitally controlled laser to engrave a gravure cell into the special plastic coating of a regular cylinder. In the field of offset lithography, Linotype in 1979 introduced the Omnitech/2000, a direct-entry phototypesetter that could compose a complete page and expose a paper printing plate. In 1982 EOCOM introduced the EPIC computer-to-plate system. It could produce a plate directly from a computer data base using a laser. Though neither was a commercial success, they pointed to future developments.

By 1990, computer-to-plate offset was finding a niche in quick print and in-plant operations for short-run, single-colour work from paper or polyester plates. These could be produced on a laser printer, a laser imagesetter, or a special laser platemaker. Such plates were limited to small presses and duplicators because most imagesetters produced a substrate no wider than 18 inches. In the early 1990s manufacturers were engaged in developing metal plates and large-format imagesetters that could expose several imposed pages on one plate. The significant development was the Heidelberg GTO-DI, introduced in 1991. This was a four-colour dry offset machine designed for runs of 500–10,000, surpassing the duplicator limitations of earlier computer-to-plate systems. On the GTO-DI, plates were imaged directly on the press by a series of electronic heads linked to the digital computer system. The machine required just one operator. Two Ontario firms, Battlefield Graphics of Burlington and Lowe-Martin Group of Ottawa, were among the first buyers of the GTO-DI. In 1993 a new laser diode system improved the

380. *CPP* (Jan./Feb. 1993), p. 32; *CPP* (Sept. 1993), pp. 31–34; *CPP* (Oct. 1993), pp. 14–17; *Professional Printer* 27,3 (1983), pp. 11–12; Field, p. 364.

381. *CPP* (July 1975), p. 33; *CPP* (Jan. 1978), pp. 73–74; Field, pp. 396–97.

image quality and processing time of the GTO-DI plates. These developments were expected to hasten its acceptance in the printing industry.[382]

The ink jet printer, first devised at Stanford University in the early 1960s, constructed characters by painting a dense dot pattern with a stream of ink drops. Although several types of ink jet printer were built, all depended on the capacity to independently give each drop an electrical charge and to direct or deflect it by an electrical or magnetic field. Both the charging and deflection of the drop was controlled by character descriptions from the computer. The quality of the resulting image was similar to that of a typewriter. By the use of multiple ink jets, full-colour could be achieved. Ink jet printers were used extensively as computer printers. But they soon also came to the attention of Canadian printers. In 1973, Toronto-based Moore Corp. announced a system for combining an ink jet printer with a conventional press to imprint variable computer output on business forms and direct mail as they were running on the press. In 1975 *CPP* reported on Mead Corporation's demonstration of an ink jet system at an American trade show. This machine was used to mock up regional editions of a daily newspaper, imprinting a variable label and regional index in a designated column of a standard front page. Mead claimed the system would eventually be used to print regionalized text, local advertisements and even customized newspapers for each subscriber. While the *CPP* report forecast "almost limitless possibilities in terms of newspaper personalization far beyond the capabilities of today's conventional processes," ink jet use remained limited to certain niche applications. It did not, as some predicted, supplant conventional printing. It was used extensively, however, for printing addresses and "personalized" messages on magazines and direct mail advertising. *Maclean's*, for example, used ink jetting to personalize messages on an automobile advertisement inside the magazine. Manufacturers improved the resolution of ink jet printers and some by 1990 were offering colour.[383]

Of wider application was the computer laser printer. These devices, introduced in the late 1970s, were based on the principles of xerography. In a standard photocopying machine, a photoconducting drum is given an electrostatic charge then exposed to light reflected from the original. Light from the non-image (white) areas of the page dissipates the charge on corresponding portions of the drum, leaving a latent "image" as a pattern of static electricity on the remaining portions. A toner powder applied to the drum adheres to the charged areas. It is then transferred to the paper and fused by a combination of heat and pressure. In a laser printer a laser light source scans the drum, distributing the charge according to character descriptions from the computer according to now-familiar principles of raster image processing. The result is a printout on plain paper. The most relevant aspect of laser printers to the printing industry in the 1980s was that, given sufficiently detailed instructions from the computer, they could generate characters that approximated in a low-resolution form the varying type styles and sizes of photo and laser typesetters. In addition, if fed information from computer graphics or scanned originals, they could reproduce line drawings and halftone images.[384]

In 1959 the British firm Rank Precision Industries announced the "Xeronic" electronic printer for computer output data. This machine generated characters on a CRT, which were then "copied" by xerography. Although it used a CRT, this machine was perhaps the first application of xerography to computer printing and clearly anticipated the commercial development of the laser printer. This latter event occurred in 1977 when Xerox introduced the first of a series of machines. For several years laser printers were

382. *CPP* (Jan. 1981), p. 20; *CPP* (Jan. 1987), p. 14; *CPP* (Feb. 1987), p. 26; *CPP* (Oct. 1987), pp. 100–2; *CPP* (June 1993), pp. 19–22; *American Printer* (March 1991), pp. 26–34; *American Printer* (Jan. 1992), pp. 22–25; *American Printer* (Jan. 1993), pp. 36–40; *American Printer* (Jan. 1994), pp. 31–34; *Typeworld* (20 June 1986), p. 22; Wallis, *Concise*, pp. 57–58, 60, 62.

383. *CPP* (June 1973), p. 29; *CPP* (July 1975), pp. 29–32; *CPP* (Feb. 1984), p. 23; *CPP* (Dec. 1990), pp. 32–33; *American Printer* (Jan 1992), pp. 24–25; Larry Kuhn & Robert A. Myers, "Ink-Jet Printing," *Scientific American* (April 1979), pp. 162–77; *Encyclopedia of Physical Science and Technology* (1992), s.v. "Printing and reprography, electronic."

384. *Illustrated Science & Invention Encyclopedia* (1977), s.v. "Xerography;" *Encyclopedia of Physical Science and Technology* (1992), s.v. "Printing and reprography, electronic." For more detailed information on laser printers see William White Jr. *Laser Printing: the Fundamentals* (Madison, N.J.: Carnegie Press, 1983).

used primarily as high-speed, high-volume computer output devices. But in the early 1980s the manufacturers began to produce small, low-cost units that could be linked to office word processors and personal computers. By linking its Macintosh with a LaserWriter printer and the appropriate page description and graphics software, Apple Computer Corp. popularized the notion of desktop publishing. Gradually, the selection of type fonts was enlarged so that laser printers could emulate typeset copy, though with poorer resolution. They were subsequently adopted for several applications besides the creation of office documents: to produce camera-ready pages for newsletters, small magazines and weekly newspapers where fine typography was unaffordable or not required; to provide proofs for designers and typographers before final typesetting on high-resolution laser typesetter; to print short and variable runs of books. One example of the latter was a U.S. venture of the publisher McGraw-Hill and the printer R. R. Donnelly to produce from electronic databases textbooks customized to the orders of individual university professors.[385]

In 1993 the North American printing world was startled by the introduction of two new four-colour "presses" that employed the electrostatic principles of a laser printer. The Xeikon DCP-1, from Belgium, employed eight printing units and a dry toner technology to print two-sided, four-colour copies with ability to alter limited areas of each page while in operation. The Indigo E-Print 1000, developed in Israel, featured a special liquid toner and a single drum that transferred its image onto an offset blanket before impression on paper. To print four colours, the paper passed through the unit four times, and for two-sided copies it passed through eight times. According to the Indigo company, any area of the image on the drum could be changed with each revolution, allowing the ultimate in versatility. Both machines were designed for short runs and, with resolutions of 600 and 800 dots per inch, did not approach high-quality commercial printing. Several firms ordered these machines but many in the industry remained cautious, at least in the short term, about their reliability. They reflected, however, a drive within the industry to continue to use the features of digital technology to quickly produce variable and extremely short runs of high quality graphic materials, to break the mass production mould that has always characterized the printing industry.[386]

385. *CPP* (April 1959), p. 80; *American Printer* (Jan. 1991), pp. 44–47; *In-Plant Printer* (Dec. 1985), pp. 47–48; *High Technology* (Sept. 1984), pp. 52–57; *Lithoweek* (supplement – 30 May 1984); *High Volume Printer* (Oct/Nov 1983), p. 55; *EP&P* (June/July 1986), pp. 19–20.

The Labour Process

Compared to the periods before and after, the years between 1920 and 1960 had been, for most workers in the traditional trades, technologically stable. By virtue of their strong unions and their skill in applying technology, printing craft workers had exercised substantial power in their relations with employers. This technological and craft stability began to deteriorate in the 1950s as offset photolithography was introduced in many letterpress shops. As the pace of technological change accelerated in the 1960s and then soared in the 1970s and 1980s, serious dislocation occurred among craft workers.[387] Despite great change, printing remained a labour intensive industry. Employment levels in the industry as a whole continued to increase, though certain crafts experienced decline. In terms of skill, the situation was much more complex. Everyday matters like wages, employment security and job satisfaction were fundamentally tied to questions of craft jurisdiction, skill, and control of the labour market and the work process. Any new

386. *CPP* (Nov. 1993), p. 32; *CPP* (Dec. 1993), pp. 13–16, 32; *American Printer* (Sept. 1993), p. 112; *American Printer* (Jan. 1994), pp. 32–34.

387. The secondary literature on labour and technological change in the printing industry is extensive. Among the most important works are: Baker; Munson; Kelber & Schlesinger; Zerker; Scott; Andrew Zimbalist, "Technology and the Labor Process in the Printing Industry," in *Case Studies on the Labor Process*, Andrew Zimbalist, ed. (New York: Monthly Review Press, 1979), pp. 103–26; Cynthia Cockburn, *Brothers: Male Dominance and Technological Change* (London: Pluto Press, 1983).

technology that workers used, therefore, would affect them directly and would in turn be shaped by their response.[388]

In late 1959 C. H. Dickinson, general manager of Ryerson Press in Toronto, called for an end to the practice of shop foremen carrying union cards. It had become too difficult for employers to exert control over the production process when their foremen held loyalty to the craft union. "Our employees," he lamented, "are no longer really ours." From the late 1950s through the 1960s, employers complained of a declining rate of profit exacerbated by union strictures on wages and work rules. In 1964 E. C. Caldwell, head of an Ontario employer group, called on management to win back rights it had let slip away. In the quest for profit, managers needed the flexibility to reallocate equipment and labour as they saw fit. But their flexibility was limited by the power of the craft unions to influence which and how many workers operated the machines. This power was based on the historic role of the printing craft unions not simply as wage regulators but as the suppliers of skilled labour. The craft union defined its jurisdiction, certified training and acted as "employment agency" to employers. As ITU president Elmer Brown stated succinctly in 1959, "our union provides craftsmen to work in the graphic arts industry." In the context of declining rates of profit, employers were seeking power to reorganize the production process. A critical aspect of this power was new technology that would loosen their dependence on craft workers.[389]

As has been noted by one of the most influential commentators on the labour process, a businessman "need not be motivated to control things by an obsession for power; a simple desire for profit will do."[390] The introduction of new technology and the ensuing struggle for control of the labour process was, in the context of a competitive industry like printing, a struggle for corporate survival. By reducing the number of craft workers required, by rendering certain craft functions unnecessary, or by transferring tasks from the shop floor to the office or studio, employers were reorienting the production process to get the most output for the wages they paid and thus to reduce their unit costs. Provided unions allowed this by surrendering their limited control over the labour process, most employers were probably content to have them remain. If workers resisted employer attempts to shed or shuffle them, the shop floor became contested terrain. This, in fact, is what occurred in Canadian print shops.

Through their unions, printing workers attempted to influence the introduction of new technology, to minimize job losses through journeyman rules, retraining, and job protection clauses or through work rules to determine how the machines would be used. While this response was partly successful, it did not thwart employers' objectives. In the 1970s, for example, the value of shipments per employee from commercial print shops increased 200 per cent while the money spent on wages and salaries rose by just 150 per cent. Among daily newspapers, the proportion of employees working in production fell while the size of editions increased.[391]

The most dramatic impact of new technology was felt in the composing room, which by 1990 had almost ceased to exist as an identifiable workplace. Computerized typesetting reduced the skills needed to enter text to the level of a typist. On daily newspapers, text input was removed from the composing room altogether and placed on the desks of reporters, editors, and classified advertising clerks. In the 1980s, the use of personal computers and disk storage completed the break between entry and composition; entry became simultaneous with document creation. Skill continued to be required for mark-up, proofreading, and page make-up. But on many

388. The relationship between skill, technology, and power relations between workers and employers has been the subject of much study and debate. Two works that have influenced my analysis are Richard Edwards, *Contested Terrain: The Transformation of the Workplace in the Twentieth Century* (New York: Basic Books, 1979) and Craig Heron & Robert Storey, "On the Job in Canada," in *On the Job: Confronting the Labour Process in Canada*, Heron & Storey, eds. (Kingston: McGill-Queens, 1986), pp. 3–33. A well-informed reply to Edwards from the perspective of printing employer may be found in Scott, pp. 104–8. For a useful appraisal of recent labour process literature see John Lutz, "Technology in Canada through the Lens of Labour History," Scientia Canadensis, 15,1 (Spring/Summer 1991), pp. 5–19.

389. *CPP* (Dec. 1959), pp. 50–51; *CPP* (Jan. 1960), pp. 78–81; *CPP* (Oct. 1964), p. 7; *CPP* (June 1970), p. 29; *CPP* (Aug. 1973), p. 10; *CPP* (Sept. 1973), p. 32; Scott, pp. 13–14.

390. Edwards, p. 12.

391. *CPP* (Jan. 1984), p. 19; *Kent Commission*, pp. 78–81; Scott, p. 107.

392. Scott, pp. 28, 38–41, 53–54.

routine jobs mark-up of copy, to indicate type size and style, line length and other typographical information, could be reduced by storing formats on computer. Page make-up for books and other simple designs could similarly be accomplished by encoding standard page breaks, headers and footers, etc. in software. With computer pagination systems, even complex page make-up was removed from the composing room, finding its way to the design studio. Proofreading, meanwhile, could be made an adjunct of the editorial process. One indication of the declining skill requirements for composition is evident in the length of apprenticeship required for trade entry. This stood at six years for hot metal compositors in 1960. In 1982 training in photocomposition was complete in one year.[392]

The result of this process of deskilling and transfer of functions was a dramatic reduction in the number of compositors and the devastation of the International Typographical Union. In Toronto between 1970 and 1978, for example, the number of ITU members working in commercial shops dropped by almost one half. Already the local union had lost nearly 700 members as a result of a disastrous, six year newspaper strike begun in 1964. During this bitter and sometimes violent dispute, the Toronto Typographical Union failed to extend its jurisdiction over new computers and in the process was shut out of the plants of all three Toronto dailies. At issue was not merely job security but the future strength of the ITU, whose leadership realized that composition functions were being eroded both by computers and by the adoption of photolithographic methods of page make up. Unless jurisdiction was expanded, or followed the composing functions shifting into editorial and business offices, then its membership would be limited to a declining number of machine attendants, typists, and paste-up artists. This, in fact, is what occurred. While ITU locals at other newspapers in Canada and the United States often secured lifetime job guarantees or generous buyout packages, composing room numbers on daily newspapers during the 1970s and 1980s were steadily whittled down by attrition. As the 1990s dawned, full computer pagination promised to eliminate those few jobs remaining.[393]

While the traditional compositor was an anachronism by 1990, many composing room tasks still existed in modified form. In fact the typographer's trade was not so much eliminated as dismembered. Some composition labour was appropriated by the software designer and embodied in computer routines. Other aspects were now performed on personal computers by editorial and office employees or by writers. Finally, still others—those requiring fine creative judgement—now took place at the design stage, wherein a designer, an art director, or an editor selected types and manipulated blocks of copy on a desktop system for automatic output on a laser imagesetter. Indeed, during the 1980s industry observers noted an emerging need for designers and desktop operators skilled both in typography and computers. At least one conjectured that this was the reconstitution of the typographic craft in a new form.[394]

As letterpress technology was supplanted by offset photolithography, the old compositor functions of page make-up and imposition, the photoengravers' trade, and the crafts of stereotyping and electrotyping disappeared. In their place, the lithographic skills of photography, stripping (page assembly from negatives) and platemaking expanded. Due to the increasing demand for and the falling cost of colour printing, employer requirements for craft workers in these fields actually expanded in the decades after 1960. At the beginning of this period, apprentices in the preparation departments were trained for up to six years in the three tasks of photography, stripping and platemaking. In addition to certain hand skills, they acquired theoretical knowledge in physics, optics and chemistry. During the 1960s employers introduced technical innovations that reduced certain skill requirements. The need for preparation craft workers was eliminated in simple, short run work by the use of copy-to-plate systems developed in the early 1960s. Using pre-sensitized paper plates and an Itek camera-platemaker, workers with a few

393. *CPP* (Aug. 1964), pp. 7–11, 58–63; *Presstime* (Nov. 1988), pp. 36–38; Zerker, pp. 265–317; Scott, p. 127; *Kent Commission*, p. 80.

394. *CPP* (June 1993), p. 27; Spring p. 35; Alan Marshall, "A Typographer by any other Name," *Bulletin of the Printing Historical Society*, 35 (Autumn 1993), pp. 8–9.

hours training could automatically expose and develop a finished plate from original copy at the press of a button. This technology was largely responsible for the success of quick printers and in-plant print shops, who exploited new markets in short run jobs long too expensive if done by conventional commercial methods. In the established graphic arts industry change also occurred. Automatic exposure meters, presensitized plates and automated film and plate processing diminished the importance of manual skill and acquired knowledge. Craftsmen were said to be giving way to "lab technicians" familiar with machines and electronic controls.[395]

The widespread adoption of scanners in the 1970s and fully electronic pre-press systems in the 1980s and 1990s demanded a further shift from manual and photographic skills to those required in operating computers. While many craft workers received a few weeks of training from employers and suppliers on the new technology, instruction was often specific to certain machines. If technology changed or they sought work with other employers, workers could find their specialized skills untransferable or obsolete. The speed of technological change and the increasing instability of employment in the 1980s and 1990s generated a constant need for retraining. In 1992 a training expert estimated that "without constant retraining, you'll be alright for about five years and then you'll be left behind." Craft unions recognized the need to retrain their members in the 1960s and joined with employers in establishing graphic arts institutes in several Canadian cities. Five existed by 1992. Among the emerging job categories for which these institutes prepared students were colour proofing and desktop page assembly. Fully eight per cent of workers in the graphic arts by 1992 were doing proofing for colour pre-press systems. Proofers, however, were the lowest paid workers in the pre-press area, earning thousands of dollars less than experienced film strippers. While desktop operator wages were higher, they were still significantly less than those of a stripper.[396]

Press workers were less affected by new technology than those in pre-press crafts. As with preparatory workers, their numbers increased with the growth in full colour printing. Similarly, however, much simple, short-run work came to be performed by unskilled labour through the adoption by in-plant and quick printers of offset duplicators and electrostatic (Xerox) printing machines. To a large extent, these printers served a new market for work not economical by commercial methods. Electrostatic printing was the cheapest method for runs of 100 or less, while duplicating proved best for runs between 100 and 1000. The A.B. Dick Model 350, introduced in 1955, was the first duplicator to feature an integral inking-dampening system that greatly simplified the task of establishing ink-water balance. The first Xerox machine was released in 1959 and required neither plate nor make-ready to produce copies. Operators of either machine required just a few hours training.[397]

In the commercial and newspaper printing fields, the major technological shift from letterpress to offset seems to have occurred without great dislocations of labour; the letterpress pressmen's union had for decades provided training in offset work. But the gradual introduction of various electronic aids and controls did alter the press operator's craft. The use of reflection densitometers, numerical displays, and various other electronic and computerized devices reduced the need for judgement based on craft experience in determining register, ink density and other factors. Similarly, manual skills became less important with the trend to remotely controlled and automated ink and plate adjustments. Press operators were required to learn new skills in understanding numerical readouts and operating computerized machinery. They worked less "in" the press and more "at" a press console and required fewer assistants to perform make-ready and keep the press running. Up to 1990 the main impact of new presses was that skilled operators could produce much more in less time than they had a few years before. Press manufacturers warned employers they could not expect to use new technology as a substitute for skill. But the growing adoption of electronic printing and computer-to-plate systems signalled a possible transformation of the press operator's craft in the near future.[398]

395. Scott, pp. 33–35, 42–44, 53–54.
396. *CPP* (June 1966), p. 41; *CPP* (April 1975), p. 48; *CPP* (June 1992), pp. 28–29; *CPP* (May 1993), pp. 27–33; *CPP* (July/Aug. 1993), p. 23.
397. Scott, pp. 34–38, 44–45.
398. *CPP* (Sept. 1989), pp. 31–32; *American Printer* (Sept. 1993), pp. 52–58; Scott, pp. 44–45; Zimbalist, pp. 114–17.

Clearly, if the implementation of the new technology could eliminate or transform old crafts, there would be a fundamental impact on the craft workers' unions. Since the 1890s, printing unions had been organized along craft lines. Workers performing different functions belonged to different unions. This arrangement began to break down as new technologies crossed craft lines. For decades, the Printing Pressmen and the Lithographers fought over the right to represent offset pressmen. This struggle intensified in the 1950s and 1960s as offset presses supplanted letterpress machines in commercial print shops. But added to this struggle were others. In the 1950s the Typographers quarrelled with the Lithographers, the Photoengravers, and the Newspaper Guild for jurisdiction over film stripping and paste-up and the use of photocomposing cameras. As photolithography continued to encroach on letterpress printing, the ITU rightly perceived these operations as threats to their control of page make-up functions. The result of all such disputes, however, was to undermine labour unity just as the industry entered a period of turmoil that was largely related to the new technology being introduced by employers.[399]

Slowly, unions developed an alternative approach to new technology: as old craft lines were blurred, craft unions began to merge. In 1964 the Photoengravers, whose craft was approaching extinction, merged with their cousins the Lithographers to form the Lithographers' and Photoengravers' International Union (LPIU). Under the presidency of a Canadian lithographer, Kenneth Brown, the LPIU continued to pursue an active policy of cooperation and merger. In 1967 the Stereotypers and Electrotypers joined the LPIU, which was renamed the Graphic Arts International Union. They were followed by the Bookbinders in 1972. This alliance of pre- and post-press workers was joined by the Pressmen in 1983 to form the Graphic Communications International Union (GCIU). The effect of creating an industrial union was that all workers in a single plant or company could be represented by one union. This increased union bargaining power and also allowed for the movement of workers from one job into another in response to shifts in technology. As well, the abandonment of craft for industrial organizing principles signified a recognition by unions of the need to recruit editorial, office, and unskilled employees in printing and publishing plants. Fearing submersion of their organization in a larger union they could not control, the Typographers' leadership resisted the merger trend even as their membership dwindled. In the early 1980s an abortive merger with the Teamsters was averted by a membership revolt, but negotiations with the GCIU failed due to mutual mistrust. Finally, in 1987 the ITU joined the Communication Workers of America as its Printing, Publishing & Media Workers sector. Later, the Newspaper Guild, representing editorial and some art employees, also joined the CWA. By 1993, therefore, most unionized printing workers in Canada were represented by either the GCIU or the CWA.[400]

399. *CPP* (March 1958), p. 84; *CPP* (April 1958), p. 5; *CPP* (May 1958), pp. 62–63, 118; *CPP* (Feb. 1959), pp. 39, 74, 86.

400. *CPP* (Dec. 1960), p. 49; *CPP* (Oct. 1963), p. 56; *CPP* (Oct. 1966), p. 66; *CPP* (Sept. 1970), p. 17; *CPP* (Aug. 1981), p. 26; *CPP* (Feb. 1984), p. 9; *CPP* (June 1984), p. 16; *CPP* (Sept. 1984), p. 8; *CPP* (March 1987), p. 10; *CPP* (April 1987), p. 10; *CPP* (Sept. 1989), p. 38; Scott, pp. 87–91, 123.

Conclusion

The electronic printing plant of 1990 was a far cry from the small shop that issued the first Halifax *Gazette* in 1752. Printing, like Canada itself, had changed beyond recognition. In the early days of printing, Canada was a scattered collection of tiny colonies with a subsistence economy where reading was limited to a tiny elite and printing an adjunct of government. By 1880, Canada was a federation stretching from Atlantic to Pacific, about to be linked by rail. Printers now produced for a largely literate population. Their newspapers and utilitarian commercial work were integral to the political, cultural, and economic life of the country. Reflecting the no longer marginal role of printing, a few large, industrial printing establishments grew up in the main cities. And virtually every town of any size could boast at least one small shop.

In conjunction with this general transformation, by 1880 Canadian printers had adopted important technical advances. Everywhere, the iron hand press had supplanted the wooden press pioneered by Gutenberg. But the iron Washingtons and their ilk were now in turn being superseded by jobbing platens and cylinder presses. The flat-bed cylinder presses were significant for incorporating a rotary impression action that greatly increased printing speed and output per worker, whether powered by hand or steam. Among other things, such presses made possible the rapid and inexpensive production of daily newspapers. The use of stereotype or electrotype plates further increased speed and edition size, as well as offering the chance to reprint popular books without the need to set type. The production of images remained a painstaking hand process, although the relatively new method of lithography promised a simple alternative to relief and intaglio engraving in wood and metal.

Forty years later in 1920, the needs of a population increasingly urbanized and dependent on wage labour were being met by manufacturers with processed foods, clothing and other merchandise. These goods, and a consumption ethic, were promoted by an infant advertising industry, by advertisements in mass circulation daily newspapers, and by the use of catalogues, posters, and increasingly colourful labels and packages. Printing became increasingly specialized and proprietors became more systematic in their business practices.

Technologically, the years between 1880 and 1920 were equally eventful. Web fed, rotary presses printing from curved stereotype plates quickly became the standard among metropolitan daily newspapers. Exploiting fully the capabilities of rotary action, these huge, expensive machines churned out thousands of multi-page papers per hour and made possible a cheap, popular press. In commercial shops, automatic feeding and electrical power increased the output of platen and cylinder press operators. Simultaneous with these press developments, typesetting was revolutionized by the abandonment of type for many applications. By the use of a keyboard and reusable, circulating matrices, linecaster operators could far exceed the output of hand compositors working with actual types. Equally revolutionary was the application of photography to the preparation of printing surfaces. By the 1890s halftone and line photoengraving were allowing the expanded use of illustrations in printing and achieving results of remarkable verisimilitude. Lithographic and gravure printers also adopted photography, though their efforts took longer to bear fruit.

Between 1920 and 1960 Canada completed its transformation from a rural, resource-dependent society to an urban one engaged in manufacturing and services. In this period mass production of consumer goods, sustained by sales to a mass market, reached a new height. Especially after World War II, the printing, packaging, and advertising industries expanded rapidly and made heavy investments in new equipment.

Technologically, most printers remained committed to letterpress, placing their emphasis on

acquiring faster and less labour intensive equipment. In commercial printing, however, offset photolithography was becoming increasingly popular as an inexpensive means of producing short runs of colour work, especially where illustrations were required. In addition, other alternatives to letterpress were applied in specialized applications: rotogravure in packaging, magazines and catalogues; silk screen for posters, banners and packaging; flexography in packaging. Printers also began to take new approaches to typesetting. In newspaper plants publishers installed teletypesetters that, like the Monotype earlier, anticipated computers by rendering text input a separate process of encoding a paper tape storage medium. As photolithography became increasingly popular, typewriter and photographic typesetting machines were adopted in order to bypass the anachronistic hot metal and proof stages of type composition.

The technological and social trends of the post-war period continued in the prosperous 1960s. In the 1970s and 1980s, the comfortable assumptions and accommodations of Canadian society were challenged. But no decline was perceptible in the taste for personal consumption or for the American popular culture that embodied its pleasures. Marketing, however, was increasingly targeted to segments of the population, as sellers rejected the old mass market paradigm. Hastened by economic recession and foreign competition, the industry became polarized between huge printing and publishing firms whose operations spanned borders and tiny local firms that served limited markets.

A general state of instability, dissolution, and uncertain transition was also evident in printing technology. During the 1960s and 1970s, the replacement of letterpress by offset photolithography was completed. As part of this process, phototypesetting supplanted hot metal technology. But even before second-generation phototypesetting machines reached their apogee, digital technology emerged to challenge it. Computers were first applied in newspaper work to justify and hyphenate coded tape. But their impact became truly revolutionary when these simple memory and calculation functions were wedded to digital character generation and to word processing technology. From this point, typesetting became an integral part of document creation. Text became subject to repeated and varied manipulation in electronic form before high speed conversion to a physical medium for printing. Similar processes occurred in the production of images, where electronic scanners converted visual information into digital data, which could be altered for colour correction, screening, sizing, and other features. In the 1980s, typesetting and scanning technologies were integrated into pagination systems, wherein page assembly itself was performed at a computer work station. Digitization also proceeded further along the production process, with the development of computer-to-plate systems that eliminated camera work, and with the introduction of electronic press diagnostics and controls that systematized quality control and reduced manual adjustments to a minimum. Finally, the introduction of electronic systems like ink jet and laser printers carried the flexibility of digital technology to the press itself, abolishing the plate entirely, at least on short runs of simple matter. As the 1990s dawned, however, none of these new printing technologies were yet advanced enough to supplant the continually evolving technology of offset lithography.

It is difficult to reduce the multiplicity of technical developments in printing to a few general trends. But over the last two and a half centuries a few common features become apparent. Early on the increasing solidity and precision of presses improved speed, register and exactness of impression. The replacement of reciprocal with rotary action and sheet with web feed improved speed and energy efficiency and reduced mechanical complexity and jarring. The production of a printing surface was transformed by the exploitation of light and photosensitized materials. The conversion of continuous tone originals through use of incised lines was superseded by grid-like patterns of dots achieved photographically with an interposed screen. The results of camera and screen were in turn replaced by dot patterns generated electronically by scanning and sampling. The composition of text was transformed by the abandonment of types for brass matrices, then matrices for photographic masters, then photomats for digitally encoded character descriptions. Page make up proceeded from the manipulation of metal printing elements to film and paper elements, and finally, to digital information elements. The inking area of a printing surface, once determined by plate relief, came to be determined, in most cases, by chemical or electrostatic receptivity to ink. In the process of implementing these technological

changes, printers have repeatedly rendered their products cheaper, more plentiful, more time-sensitive, and more various. They have also achieved visual effects, in colour, detail or artfulness, not possible with earlier tools at their disposal.

During this centuries-long process of technical change printers have, as controllers of an important communication technology, been at the centre of social change in Canada. In particular, they have provided the medium through which political and economic power has been expressed and have offered a theatre in which cultures have emerged. For long, many hoped that through print a unifying Canadian (either English, French, or both) culture might be created. Print has, in fact, allowed the spread of ideas within Canada and the conduct of distinctly Canadian discourses. But it has also been one of the primary means by which foreign ideas have entered Canada and by which Canadians have participated in cultures beyond their borders. These trans-national cultures include everything from the ever reiterated and reconceived Western intellectual tradition to the most banal expressions of American popular media and product marketing.

In playing out their critical role, Canadian printers have worked within a system of private ownership, competition, and wage labour. The ultimate tests of profit and survival have had several technological manifestations. First, print employers have interpreted efficiency at least partly in terms of labour productivity, their power to convert the labour power they buy with wages into the greatest possible output. In their efforts to introduce "labour saving" devices or restructure workers' jobs, employers met with resistance from their workers. Both sides engaged in a contest for control of the labour process.

In a reductionist sense, all workplace technology impinges on the conversion of labour power into a finished product. In reality, proprietors have not conceived production technology strictly in terms of the conversion of labour power but in terms of specific production problems. Thus Linotype machines were taken up largely as solutions to problems of cost and time. More text could be produced more quickly and cheaply and closer to the production deadline than was possible with hand composition. Similarly, cylinder and rotary presses increased the production speed and lowered the unit cost of a printed sheet, making large circulation publications viable. Offset duplicators and copy-to-plate systems, meanwhile, reversed the process by reducing unit costs and completion times on short runs. Phototypesetting, paper paste-up, and desktop publishing systems have increased flexibility, allowing quick and inexpensive alterations to jobs or revisions of existing material.

In addition to problems of speed, unit cost, volume and flexibility, employers have also sought in technology solutions for the less easily defined problems of quality and verisimilitude. Notions of good or acceptable quality and of true-to-life images or colour are culturally defined, specific to expectations common at any time or place and often influenced in a given situation by standards of acceptable cost. Moreover, the capabilities of a technology not only respond to but also create expectations. Nevertheless, it is clear that a technology like photoengraving not only reduced the time and cost of producing images, it also responded to a Victorian taste for realistic depictions of people, places and events. Similarly, the adoption of heat set inks not only allowed for faster press speeds but for faster press speeds in the production of sharp, clean colour.

The adoption of digital technologies within the printing industry since the 1960s occurred at the same time that digitization was sweeping through other industries. As well, observers of culture and technology were marvelling at the real and imagined impact of television, computers, and telecommunications on society. In comparison to these electronic media, print seemed decidedly old-fashioned, even superfluous. In 1970 Theodore Nelson, an American communications and graphic consultant, told an international meeting of in-plant printers in Toronto that "the need for hard copy is superstition." He championed "true electronic publishing" in which

> *... people write on screens, and store the copy somewhere in an assembly of digital mechanisms, so that it can be squirted through telephone or other communications links to other screens where they can be read.*[401]

In its ultimate form as "hypertext" readers would weave their way through myriad documents stored on computer and minutely cross referenced. The reader would be liberated from the

401. *CPP* (July 1970), p. 76.

sequential bias of the published document, released into "a jungle gym of ideas over which you can climb, through which you can move."[402] With considerably less enthusiasm for the jungle, American linguist and critic George Steiner predicted in 1985 a "post-literate" future in which the reading of "serious, demanding texts will become the possession of a clerisy of trained men and women" akin to medieval monastic scribes. Political power and prestige would not belong to them but to the "aliterate," the "numerate."

> *... those [men and women] who, while technically almost unable to read a serious book and mostly unwilling to do so, can, as we already know, in preadolescence begin to produce software of great delicacy, logical power and conceptual depths.*[403]

Through overstatement, both views misapprehend the likely future of print. Print does not seem to be verging on disappearance. Early "videotex" experiments in popular interactive data communications failed, despite enthusiastic promotion and participation from newspaper companies. Despite the promotions of office automation manufacturers, the paperless office seems farther from reality than ever as information technologies have encouraged the proliferation of printed documents. This abundance derives from the advantages of print: it is relatively durable, it offers a compact, portable form of display without supporting technology, it allows easy browsing and jumping from one passage to another, it provides a surface for making marginal notes without altering the text, etc. Some of these features can be approximated in electronic displays but they remain inadequate imitations of paper paradigms. It remains to be seen whether future generations will find the attributes of paper unnecessary remnants of an earlier technological dependence.

One thing that is clear from this research study is that the same technology that is said to threaten print also makes it easier and cheaper to print new documents. The introduction of desktop publishing systems, computerized typesetting and electronic printing were major developments in the history of printing. They were so important because they greatly simplified the process of creating or assembling new publications and revising existing ones. The net result of these developments was that the definition of what was a publishable document changed. "The way in which we think of documents," wrote one computer expert recently, "is undergoing a major revolution."[404] According to Michael B. Spring, most documents have historically been linear in nature and the product of one author or editor. But new types of documents are now emerging, complex and composite documents authored by groups, cobbled together or generated automatically and on demand from diverse materials held in databases. These fall under the rubric of "electronic publishing," but this term is rather imprecise. On the one hand it encompasses the storage and transmission of information for video display (like videotex and on-line databases) and the "publication" of reference works and interactive education kits on CD-ROM or other high density electronic storage media. But electronic publishing also includes the production of "hard copy" documents, although the production process is now almost entirely electronic and output may be produced at dispersed sites.[405]

New technologies have not automatically eradicated old. Old technologies are often infused with fresh capabilities by interaction with the new. And both new and old can exist side by side, serving specialized needs. Electronics will continue to excel in the transmission of time-sensitive information, information subject to constant revision, and in the storage, assembly and searching of large quantities of data. It is not inconceivable that on-line or CD-ROM systems will give cross-indexed access to entire libraries of work, although access will be only as good as the information entered and the retrieval systems designed. Often, electronically transmitted information will be required for further consultation and consequently printed. In addition, print will continue to produce many of the products it does now, like packaging, direct mail, office documents, magazines and newspapers (though possibly of a different sort), and books. The books, which have always constituted the most prestigious (though not necessarily the most influential) use of print, might be of several types: durable texts produced in large numbers; disposable ephemera like romances and pulp fiction

402. Ibid.
403. *Publishers Weekly* (24 May 1985), p. 48.
404. Spring, p. 4.
405. Spring, pp. 12, 39

also produced in volume; technical and reference documents and textbooks produced on demand, in small batches and constantly revised.

Although the skill of prediction is greatly valued, its accomplishments are not impressive. People have repeatedly failed to anticipate the impact of the new technologies they introduce, sometimes missing their far reaching possibilities, other times inflating their powers to free us from the bonds of history. No one could have predicted with the printing of a papal indulgence in 1454 either the form or the impact that Gutenberg's invention would later have. The future of print is equally difficult to predict. Print has been one of the most important technologies of the last five hundred years, electricity of the last one hundred and fifty, electronics of the last eighty. All now perform distinct functions, yet all are also integrated and dependent on one another. There are no signs today that any one of these is about to disappear. It appears that in the future print and its more recent communication counterparts will continue on their parallel yet tangled courses. And all, as the means by which people converse with one another, will continue to be central to the ongoing transformation of Canada.

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