THE EVOLUTION OF VICTORIAN AND EARLY TWENTIETH
CENTURY OFFICE BUILDINGS IN BRITAIN

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PhD
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1984
I hereby declare that this thesis has been composed by me and the work is entirely my own.

Frank M. Locker
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ABSTRACT

This study traces the evolution of office buildings in Britain from approximately 1840, the early years of the office as a separate building type, to World War I. In this period offices were transformed from small buildings almost indistinguishable from houses to large specialised buildings which contained most of the constituent components of modern offices.

Four major aspects of offices are analysed and interrelated: form, structure, services and style. Changes in building size and organisation, function needs, and contextual pressures are included as components of form. Structure includes the theoretical, regulatory, and attitudinal issues associated with the development of fireproof floors and full framing. Application and integration of lighting, and central heating and ventilation, are the components of services. Constantly changing expression and its relationship to contemporary theory and problems in offices are studied in style.

Due to the unique context and intensity of development, office buildings in the City of London receive heightened attention.

The substantial differences between Victorian and early twentieth century offices warrant separate analyses of each.

Major developments in Victorian office buildings include the growth in size, height and specialisation of buildings; the response to natural lighting needs; the constraints of 'Ancient Lights;'; the impact of the lift; utilisation of rudimentary central heating and ventilating systems with continued use of the fireplace; development of internal iron framing and fire-resistive construction; the application of numerous styles to offices; and stylistic response to design within severe functional and contextual constraints.

Early twentieth century offices evolved with major changes in building planning through the application of 'scientific office management' ideas; continued growth in building size and height; stylistic influences in planning; integration of electric lighting; full acceptance of central heating and the demise of the open fire; controversy and application of full framing; concrete framing; stylistic acceptance of office buildings; and the continued variety of new styles.

A roll call of representative and influential buildings summarises the study.
PREFACE

The research and documentation of this thesis could not have been completed without the support of numerous individuals and institutions. Several of them deserve special recognition and thanks.

My advisors, Prof. C. B. Wilson and Mr. Martin Birkhans, supported the concept of my thesis and acted as advocates for my work.

The National Library of Scotland was an invaluable resource, especially for periodicals and illustrations. My requests undoubtedly taxed the patience of its kind staff.

Many archivists, architects and managers shared the unduplicated resources of their respective institutions. The most helpful were Mr. Ray Tye, Archivist, Phoenix Assurance Co.; Mr. R. H. Reed, Archivist, National Westminster Bank Ltd.; Mr. Edwin Green, Archivist, Midland Bank; Mr. John Booker, Archivist, Lloyds Bank; Dr. John Orbell, Baring Brothers and Co. Ltd.; Mr. George Gneditch, Trehearne & Norman, Preston & Partners; Mr. Michael Martin, City Offices Co.; Mr. Baker, Warnford Property Co.; Mr. Mackett, Wilson Mason and Partners; Ms. Cann, British and Foreign Bible Society; Ms. Perry-Jones, Archivist, Magdalen College; Mr. William Knight, Kingham Knight and Assoc.; Mr. G. R. Ellison, Refuge Assurance Co. Ltd.; Mr. P. G. Bell, Royal Liver Friendly Society; Mr. David Luty, Archivist, Royal Insurance; and Mr. J. Gordon Read, Archivist, Merseyside County Museums.
Mr. Peter Light, Trollope and Colls Ltd., kindly allowed unlimited access to his company's microfilm collection of early City offices.

Dr. Roger Harper, University of Sheffield, shared his understanding of Victorian and Edwardian building regulations. Dr. Quentin Hughes reviewed aspects of Liverpool office building. Sir John Summerson offered his insights of Victorian building.

A scholarship from the University of Edinburgh, and a Rotch Travelling Scholarship, Cambridge, Massachusetts, provided support necessary for tuition and travel.

Ms. Cynthia Rand typed drafts and final copy with unusual patience and dedication. Mr. Michael Hays and Mr. James Stufflebeam assisted with the illustrations.

Most importantly my wife, Kathleen, offered the support and encouragement, and hours of reading and proofreading necessary for the completion of this effort. Our children, Brendan and Erin, waited patiently for me to finish.

In any work of historic research the necessary task of accurately accounting for dates is difficult. In architecture the task is compounded because the elapsed time to first design, then build a building, generally took several years. Office building dating is especially difficult because the information about many buildings is limited to isolated periodical articles. The dating of offices must necessarily tolerate an accuracy to within several years. Unless additional information has been available, office building dates employed in this study reflect the dates of publication.

It would be inaccurate to establish single dates for the beginning, end, and points of major change in this evolution. The initial growth and development of office buildings reflect the time period, intensity, and attitudes of Victorian architecture. A different
kind of office building featuring modern forms and systems was evident by Edward's reign and continued until the early 1920's. In this work the term 'Victorian' has been used for events and buildings up to the years around the turn of the century. 'Edwardian' and 'early twentieth century' cover the years from approximately 1900 to 1920.

The chapters have been structured to articulate the office evolution in a systematic manner, but they vary considerably in length, focus, and organisation. This is a reflection of the varied issues, the importance, and the amount of information available on different aspects of offices. Chapter Seven, *Early Twentieth Century Structure*, was drawn largely from an article by the author in EAR 7, a publication of the University of Edinburgh Department of Architecture.

Research relied considerably on contemporary periodicals (see Bibliography). Of those the most valuable proved to be *The Builder*. From its inception in 1843 it consistently showed more interest in City architecture, building technologies and 'Ancient Lights' than any of its younger competitors. It is the only periodical consistent enough in its coverage related to office buildings to form a basis for conclusions about general patterns. *The Builder* has provided a considerable number of illustrations, editorial observations, and data presented in the appendices.

Since developments in the City of London and Westminster formed such a major part of the office evolution, and additionally varied considerably from street to street, maps of the cities have been included for reference in Appendices 4 and 5.

The research necessary for this study investigated several areas as yet untouched by other modern analyses. Hopefully the outline presented here can be challenged and supplemented by future related research.
CHAPTER 1
INTRODUCTION

The formative development of the office building in Britain has generally escaped the serious critical attention of architects and historians. It is surprising that a building type which intensely records several critical issues in the development of Victorian and Edwardian cities, and continues today as a dominant part of many modern cities, has remained so overlooked.

AN OVERVIEW

From the first Victorian years to the early decades of the twentieth century, the office building in Britain evolved as a gradual, often difficult response to physical context, functional needs, stylistic ideals, economic pressure, and emerging building technologies. The changes over eight decades were profound. Early Victorian buildings were virtually indistinguishable in organisation and size from private houses. By World War I, however, offices had grown in size and stature to be among the largest and most monumental buildings of the period.

The evolution was slow, constrained, and convoluted. Developments were often more related to circumstantial issues than to matters able to be calculated or controlled. Office space had explicit functional demands, yet office buildings took their form from a variety of other forces. Lot size, land value, size and
placement of neighbouring buildings, street location, the state of technology and attitudes toward it, and opportunities for commercial display usually had greater influence on building design. A thorough understanding of office buildings requires analysis of the physical, social, commercial, economic, and technological contexts within which they developed. Perhaps more than any other building in Britain, the office is contextual architecture.

Range of Issues

What little attention modern critics have given to office buildings has generally been stylistic, focusing on selected topographical or seminal developments. Studies analysing only these aspects of office buildings, while interesting and significant, fail to recognise some of the most important developmental issues.

This study attempts to analyse the range of important contemporary design issues. It necessarily uncovers areas which have been relatively untouched by modern analysts. Among the more important of these are the 'Laws of Ancient Lights,' constraints of building regulations, influences of tenant rental schedules and property values, attitudes toward lifts, artificial lighting, and fire protection theory and technology. Others, such as heating and ventilation, which have only begun to be analysed by such writers as Banham, Brüegmann, and Guedes, need further elaboration to clarify their roles in office building design. The understanding one gains from technological application in so common a use as offices is quite different from the significant buildings analysed by Banham or the initial installations identified by Brüegmann. Stylistic issues, integral to the office building evolution, must be reviewed with recognition of the unique problems of offices, such
as their street architecture context and the continuous conflict between stylistic ideals and functional needs. Office buildings were measured by their designers and owners in functional and economic terms. Size and exuberance often prevailed over taste and refinement. The maximisation of volumetric potential and the careful maintenance of accrued rights were more difficult, long lasting, and important tasks than that of facade design.

Several understandings emerge from a wide ranging analytical approach. One is that buildings that are commonly acclaimed for one of their aspects can be quite mundane in others. Norman Shaw's New Zealand Chambers, for example, a most stylistically innovative office building, had a commonplace ventilation system and a structural system almost retrograde. Shaw subverted the intentions of the building regulations by a carefully contrived plan shape and iron doors. This disparity in quality levels among the various aspects of a single building is perhaps typical. Single issue analysis, however, tends to overlook these differences, and reduces the appreciation of the overall richness and complexity of building design.

Another understanding that emerges from this study is that stylistic enthusiasm displayed by historians must sometimes be tempered by practical considerations. In certain cases credit attached to expressive feats can be unwarranted. To cite New Zealand Chambers again, historians have generally attributed the building's success to the lighting made available from Shaw's innovative oriel windows. The basis for this seems to have been the published rental figures. These rates however were not unusual in the City at the time and, more importantly, were quoted for the portion of the building that was completely roof lit, and well over 150 feet back from the famous facade. It seems doubtful that the building's commercial success
could be solely attributed to its facade design. Another example is that of John Gibson's celebrated National Provincial Bank headquarters in the City. Built in 1863 as the London office of a well-established bank, it presented an apparent single storey with a giant Corinthian order to Bishopsgate. Summerson attributed the form entirely to an expression of power and style, noting 'the National Provincial here dispensed with the profit arising from office letting and built a single storey building of noble scale, bolder and grander than the Bank of England itself...'. While the expressive potential of a single storey building could not have been overlooked by the bank's Board of Directors, Gibson could not have designed a more ordinary, multi-storey building even if directed to do so. The building height was limited by light easements claimed by a now long departed neighbour. Gibson's work is more accurately seen as a skillful exploitation of what few opportunities existed within the easement restrictions, rather than solely a stylistic effort.

The example of the National Provincial Bank is particularly relevant to the entire evolution of offices. John Gibson had abilities necessary for the professional survival of any office building architect, particularly in the City. He responded to the constraints of the physical context and negotiated a design settlement. The importance of context and the demands for negotiation in office building design were the two most consistent and critical factors in the office building evolution.

Negotiation best describes many of the activities of office building architects. The settlement of 'Ancient Lights' disputes to determine maximum building size is the most obvious, but a spirit of negotiation pervaded most aspects of office building design.
proof floors were evaluated for their thickness, lest they might impinge on limited vertical dimensions. Room size, shape and sectional proportions were carefully balanced against potential light patterns from grudgingly accepted lightwells or windows on narrow streets. Questions of style also became questions of negotiation, as the stylistic demand for solid looking buildings conflicted with the functional need for large windows. The difficulty of successfully resolving this latter conflict may be why so many office buildings cannot honestly be admired for their visual accomplishments.

Perhaps this lack of success explains why office buildings have so far eluded extensive historical study. One must look beyond style, however, with an understanding of context and negotiation, for the important aspects of the office building evolution.

General Trends

This study records and explains the general trends in office design. As such it is a framework which provides a context for extraordinary office building developments and helps identify the position of office buildings in the urban and architectural developments of their time.

Wayne Attoe, in Architecture and Critical Imagination, has noted that a history based on seminal works is necessarily a distorted one because it cannot accurately reflect general developments. 8 Most buildings, he argues, are designed in response to standard problems of their type. 9 This is especially true in office buildings, where so many examples can be described as almost systematic responses to common problems and constraining conditions.

Office buildings, by their very nature, were required to compete with their immediate neighbours. Building design, especially when executed by one of the office specialists, was done with an intimate
knowledge of what had, and had not, been locally successful. The ultimate standard of success was related to the amount of space provided, functional efficiency, and return on investment. Innovation, whether in style, form, or technology, was rarely highly valued.

An historical analysis focusing on common trends rather than celebrated accomplishments inherently contains several academic liabilities which must be recognised.

The most important of these is the question of how trends are perceived and how sharply they are articulated. For unusual, noteworthy, or highly celebrated accomplishments the issue is moot. Analysis can directly reflect contemporary notice, comment, and controversy. With the distance of time, one can interpret, order, and assign significance to events. The greater the detail of contemporary notice, the stronger the basis for modern analysis.

General occurrences, common constraints, and standard methods prove to be more elusive. Research involves studying a wealth of material, searching for general patterns rather than specific or unique events. Judgment must be based on modern review rather than on cues gleaned from contemporary comment.

Office buildings did not evolve without contemporary comment, but their ubiquitous nature, pragmatic and unartistic goals, functional and economic bases, and difficult and constantly evolving legal and physical contexts all tended to limit the interest of both the architectural press¹⁰ and the leading contemporary architects.¹¹

The second liability lies in the selection of a method to communicate general trends accurately and concisely. The technique employed here is one of identifying and elaborating on characteristics of representative buildings. It is difficult if not impossible
to typify trends more accurately than this because of the lack of contemporary documentation and modern research. Nevertheless, critical judgment is necessary in the selection of these buildings. As Reyner Banham has pointed out, such judgment is not without the risk of misrepresentation or misinterpretation. 'In the light of partial knowledge one cannot specify with certainty, only typify with hope.'

The buildings included in this study were selected because they contributed to or represented developments in office design. Certain office buildings, perhaps commonly recognised as topographic features or as works within a well-known architect's ouvre, might not have been chosen for inclusion here. Additionally, the balance of attention devoted to buildings here may not reflect significance implicitly suggested by other modern analyses. Philip Webb's small office at 19 Lincoln's Inn Fields, for example, had virtually no role in office building evolution, although it was significant in the architect's personal development and in the Arts and Crafts Movement. Peter Ellis's Oriel Chambers in Liverpool, perhaps today's most widely known nineteenth century office, played virtually no role in the general office building evolution. Its remarkable facades were denigrated by contemporaries as intensely as they have been praised by modern historians. Its limited contemporary influence is reflected in its modest notice in this study.

With the difficulties just outlined it is presumptuous to contend that this study is anything more than an initial attempt to analyse this complicated building type. The detailed analysis provided here can gain substance and correction only through additional research in related, but as yet untouched, areas.
Several important landmarks in time, place, and definition serve to mark the bounds of the formative evolution of office buildings in Britain.

**Time**

This study encompasses the first eight decades of office building development. Many events, taken singularly, were unremarkable. When viewed together, they form a complicated and constant evolution.

Offices at the beginning of Victoria's reign were virtually indistinguishable from houses. As the inherent limitations of the house model became apparent, offices began their own specialised evolution. Within a generation offices had crowded out other uses from the centre of the City of London, and by Victoria's death they had done the same in major provincial cities. All aspects of office design, from plan organisation to structure, services, and stylistic expression had changed once if not several times. The late Victorian office building represented sixty years of slow evolution.

Quick and universal changes occurred, however, in the first two decades of the new century, as offices incorporated changes in business theory, new technologies, and stylistic attitudes. Many of these were prompted by incursions from American promoters, businessmen, and builders, as well as a growing British appreciation for American design. The American influence in Britain has been analysed by writers such as Leonard Eaton, but in office buildings it extended far beyond his stylistic attention to include structure, heating, lighting and functional organisation. The total change was phenomenal. Business needs, which in the nineteenth century were
either neglected or relegated to specialised areas like the City, suddenly were culturally accepted. Scientific office management techniques, inspired and often promoted by American companies, found their way into British offices through books, magazines, courses, and office furniture and equipment, and altered the functional basis of office design. Steel and concrete framing systems, developed in America and the Continent, found ready application in office buildings. Centralised heating and ventilating systems, available throughout the Victorian years but only partially applied, were almost at once completely accepted. Office design, the traditional domain of specialised architect-surveyors in the City or provincial architects in generalised practices, was taken on by leading Edwardian practitioners. Architects like John Belcher and John Burnet produced designs for offices which helped set the course for architectural design in general.

The net effect of these simultaneous changes was a twentieth century office building vastly different from its Victorian predecessor. By the time the First World War slowed developments most of the primary characteristics were set and major systems of modern office buildings were in use. Building systems, acceptance of office management techniques, and the recognition of office buildings as viable contributors to the development of architectural style have continued to be constituent elements of modern offices.

The changes around the turn of the century were swift and encompassing. To emphasise the distinctions between Victorian and early twentieth century offices, each has been made the focus of a separate part of this study.
**Definition**

Whilst the temporal boundaries of the early office building evolution can be drawn with relative certainty, those related to the definition of offices require considerably more judgment. It is necessary to define the office as a building type, and to distinguish it from similar or related uses. There is no agreement on the definition in modern analyses, a condition which arises from the diffuse nature of office work.

Duffy, Cave and Worthington\(^{14}\) have commented on the difficulty of defining the office as a building type, despite the relative ease in identifying the function of an office. They have traced the function back 2000 years to basilicas and market places. Clerical workers have always been inherent to the office function; since the beginning of Victoria's reign these 'black coated workers' became increasingly specialised and could be found working in a wide variety of places under greatly varying conditions. They included law clerks, railway clerks, bank clerks, municipal officers and staffs, and commercial clerks, typists and copyists. Each was a separate category hardly interchangeable with the others,\(^{15}\) yet each was a clerk performing office functions.

The basis of the difficulty in defining offices while easily defining the function, or identifying the clerks, was described in the 1934 *New Survey of London Life and Labor*:

> Clerical work is not an industry in itself, but an occupation or service common to a large number of industries, and generally speaking it may be distinguished from other commercial operations by the fact that its technique is essentially concerned with methods of recording and accounting rather than with the nature of the transactions to which the records relate.\(^{16}\)

Any definition of the office building based solely on functional activities would potentially be as wide-ranging and diffuse as the
clerical activities just noted. It could prove to be unmanageable, for other considerations do not correlate with functional categorisations.

Architectural historians have articulated the office building in a variety of ways. Pevsner, in A History of Building Types\textsuperscript{17} has chosen to include offices with warehouses and shops, but analyses the development of banks as a separate heading. This distinction is perhaps most appropriate for the world view that Pevsner takes, but the categorisations are made primarily on stylistic grounds and are not very relevant to Victorian and Edwardian Britain. Nicholas Taylor's Monuments of Commerce\textsuperscript{18} makes few distinctions between offices and other commercial buildings; it is rather a catholic grouping of architecture related to trade than a critical study. Henry-Russell Hitchcock's works were the first to focus modern attention on the formative years of the British office building. In 'Victorian Monuments of Commerce'\textsuperscript{19} he traces a line of development across banks, insurance companies, speculative offices, warehouses and shops, but minimises the functional and expressive distinctions among them. Architecture: Nineteenth and Twentieth Centuries is organised, like Pevsner's Types, with banks treated separately from a grouping of insurance companies, offices to let, and warehouses.\textsuperscript{20} Guedes's Encyclopedia of Architecture and Technological Change likewise distinguishes banks from other types of office buildings.\textsuperscript{21}

This study includes insurance offices, banks, offices to let, offices for private companies and institutions, and solicitors' offices. As such it does not reflect groupings made by other modern analysts, particularly in its consideration of banks as offices.

Distinguishing between banks and other types of commercial buildings, and grouping offices to let with warehouses has a certain
validity, but it can only be justified when one holds a world view or when the analysis is heavily biased towards stylistic concerns. Beyond questions of style, banks shared a greater similarity with other office buildings than any offices did with the storage and sales of materials in warehouses or shops.

The primary functional distinction between banks and other offices was the banks' need for large uninterrupted halls. The Victorian banking hall was a clerical office, with as much as three quarters of its space devoted to clerical operations in contiguous desk arrangements. Other offices, such as insurance companies and, later, shipping firms, had clerical staffs that could rival in numbers those of banks. Differences in the work, however, allowed greater compartmentalisation of tasks and, as a result, generally smaller spaces and less exuberant architectural displays.

Considerable variation exists among the offices included in this study, but all share several common factors. First, all were buildings in which clerical work was the primary function. Secondly, they were built to facilitate commercial transactions. These two factors exclude many buildings in which office work occurred, such as Manchester warehouses which had counting houses but were not designed around the needs of office work. Excluded also are public administration buildings, which were often public monuments that hardly resembled the ordinary office.

The office buildings defined in this manner form a relatively coherent group. Their varied and often competing facades established the streetscape of the centres of British cities. The offices responded to many of the same functional needs, particularly lighting. All were built in an economic context that emphasised return on investment. The few basic functional or expressive distinctions that
existed early in Victoria's reign soon became blurred. Banks often built offices to let or offices for their own staff adjacent to their public offices. Speculators built halls which might be let to banks, insurance offices, shipping companies, or even shops. Changes in organisational patterns due to functional needs and the application of technology tended to minimise distinctions among offices. By the end of the nineteenth century, the major banks, for example, had more space in 'offices to let' sized spaces than in grand public halls. Many offices, especially in the City, were designed by a highly specialised corps of architects, few of whom are now remembered. The difficulties of an office building practice need elaboration, for these specialists contributed as much to the development of Victorian and Edwardian cities as did the designers of monumental public buildings.

**Geographic Bounds**

Many of the factors which stimulated office building development and which contributed to their organisation did so on a national scale. A full accounting of these factors requires a survey that encompasses developments throughout Britain.

London, initially in the City and later in Westminster, was the setting for the most intense office development in the country. Many of the issues and patterns were developed here and later extended to other cities. The City of London was unique in several respects, however. It had an unusual concentration of bank and insurance company headquarters, each expressive of success in the business community. Its narrow streets restricted available lighting. An irregular street plan created difficulties in facade design. Property sizes varied from the largest in the country to those that were
almost too small to hold much more than a single room. Building sites were often leased. The value of land near the Bank reached a level by mid-century that was unmatched until the turn of the century in New York City and Chicago. The values in these two cities provoked the raising of the skyscraper, but in London they merely provoked the raising of the rents, and brought about a more subtle form of city development: concentration around the Bank of only the wealthiest of companies.

Some of the principal architects involved in the evolution of office buildings have established reputations. John Belcher, John Gibson, J. J. Burnet and Norman Shaw are among them. Their contribution to office design, in the City and elsewhere, has not been generally appreciated and has certainly never been assessed relative to the development of the building type.

Office design in the City was an architectural endeavour which required more common sense and specialised knowledge than imagination and artistic skills. Often acting professionally as surveyors, City architects shared a wealth of understandings and negotiating abilities that have yet to be unraveled or recorded. They shrewdly responded to owners' needs, site constraints and physical context while negotiating design solutions. Edward I'Anson is perhaps the most well-known of these. His fame resides primarily from the design insight he provided in his 1864 RIBA address. I'Anson later rose to become President of the RIBA. So did two others in City practice, John Whichcord, and J. MacVicar Anderson. For the most part, however, architects 'of this group...(were) not often seen among their colleagues at Conduit Street,' the RIBA headquarters. Men such as F. W. Porter, Delissa Joseph, Henry Baker, F. and H. Francis and T. C. Clarke and his son H. C. Clarke, to mention only a few,
played continuing roles in the day to day development of City offices. Their contributions, while individually small, are significant when analysed as a group and viewed over a period of several generations.

London was the centre of office design, but restricting this study to London would overlook some unique and critical developments in other parts of the country. The commercial pressures that set the structure for office design were similar, though less intense, throughout Britain. The 'Law of Ancient Lights,' so instrumental in the City, was in effect throughout England, but not in Scotland as the turn of the century office development in Glasgow clearly shows. Liverpool and Manchester shared a unique type of building organisation related to the cotton trade. Liverpool was unusual in having offices arranged around courts, many covered with glass roofs.

Similarities of offices around the country were stimulated by several factors. With the rise of the joint stock companies in the 1830's and 1850's, centralised administrations in banking and insurance rose with the power to control building design on a large scale. John Gibson for example designed for the National Provincial Bank throughout the provinces. T. B. Whinney, architect for the London, City, and Midland Bank, did likewise. The Royal Insurance Company controlled its building holdings through its Liverpool office. With the publication of The Builder, starting in 1842, and the Building News from 1857, communication of architectural issues, including certain aspects of office design, was greatly enhanced nationwide.

All parts of the country cannot be given equal attention in so short a study as this. Urban developments were most relevant to office evolution and necessarily receive more attention than those in
small towns. The City of London was the setting for many of the earliest and more significant office buildings. The contemporary periodicals were most aware of London developments, which receive most of the attention in this work. Wales, by virtue of its rural character and the general oversight of the architectural press, receives virtually no attention in this evolution. Provincial cities are important in offering insight as contrasts to London developments and for their occasional seminal office buildings.

FOCUS

This study focuses sequentially on four important aspects of office buildings. These areas are building form, developments in structural systems, incorporation of building services, and trends in style.

The division allows analyses within each of the highly separate social, physical, technological and artistic contexts that characterised Victorian and Edwardian Britain, reflecting the degree of independence inherent to each aspect. In contrast to the early Modern Movement, in which technology and function had a great influence on stylistic and formal developments, British office buildings evolved with these aspects largely separate from each other. This does not suggest that the important connections between the various aspects will be overlooked. The functional need for natural light for example, is well-known through the works of Hitchcock, Summerson and Taylor. But the impact this need had on expression needs detailed analysis. The influence of narrow streets on lighting and style is not well-known. Neither is the impact of building regulations on style, nor of electric lighting on building depth. Interrelationships between aspects such as these are important but
they do not diminish the validity of separate analyses.

The evolving form of office buildings is a record of response to diverse, often conflicting, and slowly changing forces. Analysis of the size, shape, and organisation of office buildings gives a rich understanding of the nature and extent of these pressures.

The forces which shaped office buildings fall into several categories. Office functions, including the size of clerical staffs, functional relationships, office organisation theory, and the need for natural lighting created the major internal pressures on office building form. Land costs and office rental schedules influenced overall building height. The physical context, especially street width, lot size and shape, and height and age of neighbouring buildings, established constraints which controlled height and wall profiles. Building regulations and the evolving 'Laws of Ancient Lights' were further constraints. Developments in technology, such as lifts, lighting and heating, had at times a further influence on office building form. Lastly, changes in style had a minor but highly visible impact.

The nineteenth century was an exciting period for the development of building technologies. Offices in 1840 were technologically little different than houses, with timber floors, brick walls and a fireplace in every room. But as the century progressed the pressures of urban compaction, the concerns for fire prevention, and the increase in the size of office spaces, provoked a slow change in the technologies employed in offices.

Of primary concern are the changes in building structure and in lighting and heating and ventilating services. Structure changed from timber and masonry framing, through patent flooring systems, to the adoption of modern full framing techniques. Heating and
ventilation were always problems in offices. The traditional open fire provided both, and showed incredible staying power throughout Victoria's reign. Its performance was always challenged, and by the turn of the century so were its economics. Technological improvements brought quick favour to its successor: 'artificial' systems. Artificial lighting enabled clerks to work long winter hours, but gas burner technology in the nineteenth century was awkward, tiresome, and frightfully polluting in offices. The electric light of 1880 offered great promise and eventual freedom from these ills, but it took twenty years for the switch to electric to be decisive, and another ten before its advantages were uncontested.

Development and integration of these technologies resulted in offices that were generically the same as today's modern buildings. The embryonic years of modern systems in offices has not yet been thoroughly researched. It is important to do so for it gives understanding to an often overlooked aspect of historical development: the common application in an average situation.

Historians of technology have focused on the seminal developments and on buildings that were most critical in the early application of the technologies. Giedeon, for example, in Space, Time and Architecture, dwells on those buildings which, for reasons of use, economics, or style, were prime candidates for innovative structural applications. The lessons from Condit's research on the Chicago skyscrapers are largely ones of extreme conditions and novel responses. Reyner Banham's Architecture of the Well-Tempered Environment, concentrates also on unusual, non-representative examples.

Studies such as these are certainly useful and valid, but they
present only a partial historical view. They stress a primal relationship between obvious need and innovative response. But few cases are ever so clear as those selected for examination.

If the technological lessons derived from those studies just cited above are related to innovation, then those coming from a study of office buildings are ones of application. Contemporary criticism of technological innovations, problems in initial installations, the time lag before general acceptance, and the final motivations in acceptance are the lessons that emerge from the study of technology in office buildings. The steel frame for example was twenty years old before its general acceptance in offices; hot water 'warming' had to wait sixty years to become the preferred mode of heat. Historical analysis bent on justifying and supporting the Modern Movement would have overlooked these issues or dismissed the commonly held attitudes as retrograde. Perhaps now that the basis of the Modern Movement has been challenged, the technological events which supported it can be seen with the richness and complexity they inherently possessed.

Of all the issues in the evolution of office buildings, those related to style have been the most discussed. There remains, however, room for analysis, for few critics, modern or contemporary, have approached the subject with full empathy for the difficulties in achieving stylistic success while accounting for functional needs and circumstances of siting, proportion, and context.

In offices most questions of style focus on street facades. This small fragment of the total building has never failed to provoke the most comment among contemporaries and historians. Victorian and Edwardian Britain was a virtual smorgasbord of changing, often embattled stylistic developments. A full range of influences can be
found in the facades of offices across the country. Accounting for these stylistic variations as they were applied to offices is necessary as a framework for analysis. More important, however, is an evaluation of their success and the accommodation and negotiation required to achieve it.

Office buildings are among the primary contributors to street architecture in Britain. Street architecture concepts focused on the relationship between individual buildings and the coherent streetscape. When Victoria was crowned the concept wasn't more than seventy years old, and in the following seventy years to the First World War it was to be redefined several times. As it was changed, office building design changed.

Another major issue related to the compositional problems of matching functional needs and site circumstances with stylistic goals. Overall proportions, due to site width and the economically determined number of storeys were always circumstantial. Architects worked hard to mitigate the problems of unfortunate proportions, while at the same time wrestling with the questions of window area, appropriateness of style for use, and the restrictions of building regulations.

The resolution of these issues was most visible in the facades of buildings that were in themselves highly unremarkable. These buildings underscore a major point about the evolution of offices: their facades expressed not just the average skills of ordinary architects, but more importantly, the conflicts and constraints that formed the basis of office building design.

**OFFICE BUILDINGS IN MODERN STUDIES**

Office buildings in Britain have been analysed in other modern
works, but many important aspects have not yet been covered. By far most of the attention has been on style, with other issues included only as support. A brief review of other modern works will outline the range and depth of office building analysis. They fall into several categories: biographies; topographies; type, style or technology studies; and those few works so comprehensive they defy categorisation.

Biographies are valuable for the depth of analysis they can present about particular buildings. Unfortunately the number of biographies available does not begin to approach the number of quality architects Britain has produced. There are even fewer biographies of those involved in office design. Andrew Saint has done an excellent job of relating Norman Shaw's brief excursions into office design to the rest of his career. David Watkin's *Life and Work of C. R. Cockereill* has valuable analyses of the London and Westminster Bank and the Sun Office in the City, and the Liverpool London and Globe Office and Bank Chambers in Liverpool. The reproduction of building sections is particularly revealing. Two other biographies worth noting are Fiddes and Rowan's *David Bryce*, published as exhibition notes, which briefly covers Bryce's Edinburgh office building œuvre, and Stuart Allen Smith's contribution on Alfred Waterhouse in Jane Fawcett's *Seven Victorian Architects*. Smith analyses several buildings not covered by others.

Studies of particular stylistic eras contain perhaps the most abundant material on office buildings. Stefan Muthesius's *The High Victorian Movement in Architecture* identifies the seminal Gothic buildings, relates them to theory, and evaluates their success with cognisance of the functional pressures for large windows. James Steven Curl focuses in on the provocative and noteworthy designs of
E. Bassett Keeling, one of Goodhart-Rendel's 'rogues,' in his Victorian Architecture: Its Practical Aspects. Mark Girouard's Sweetness and Light discusses Shaw's New Zealand Chambers in depth but treats its influence on commercial architecture only very generally. French Renaissance offices are discussed in Donald Bassett's The French Renaissance Revival In British Architecture 1824-1914, a Ph.D. thesis from the University of Edinburgh, 1979.

Stylistic events at the turn of the century are covered in several volumes by Alistair Service. Edwardian Architecture offers brief catalogue-like glimpses of many office buildings. Edwardian Architecture and Its Origins, edited by Service, offers biographical studies of Belcher, Burnet, and the Glaswegians. Service's London 1900 takes a specific look at office buildings, among other types. It is unusual in that its purview extends to the interiors of the buildings. Service has elevated the previously unnoticed office work of Treadwell and Martin to a new level of attention. The book is noteworthy for these endeavours, but it is at times shallow, and sometimes rushes to erroneous conclusions. The last book worthy of note is Robert Macleod's Style and Society. Macleod presents a very comprehensible discourse tracing major stylistic trends from the Goths to Lethaby, and in doing so relates the office work of Webb, Shaw, Burnet, and Belcher.

Topographic studies present valuable resources that are unique because they develop the contextual understandings so necessary in the study of office buildings. David Crawford's The City of London and Its Architectural Heritage and Michael Hansen's Famous Architects of the City of London, both popularly written, show reasonable discrimination in the selection of examples. Much more scholarly but just as readable are the books in the Lund Humphries series.

Analyses based on building type are fewer in number and offer slightly different documentation. Pevsner's *A History of Building Types* fails to give sufficient attention to British office buildings, deferring after only a few examples to American developments. Guedes's *Encyclopedia of Architecture and Technological Change*, follows much the same pattern, but covers British developments in more depth, including technologies. Some of its statements are tentative, an accurate reflection of how little work has actually been done in this area. Henry-Russell Hitchcock's classic 'Victorian Monuments of Commerce' opened modern analysis of British offices, and many of its insights have formed the basis of all related work since then. It does suffer from an overeager search for Modern Movement precursors. The work however must stand as one of the most important on office design. Nicholas Taylor's *Monuments of Commerce* breaks little new ground but reproduces some period watercolours with a quality rarely seen.

Henry-Russell Hitchcock's two master works defy categorisation. Both *Early Victorian Architecture in Britain* and *Architecture:*
Nineteenth and Twentieth Centuries concentrate on stylistic developments in offices to the 1860's, with occasional references to the functional, legal, and technical factors involved. These works, with his 'Victorian Monuments of Commerce' provide the most balanced analysis of early offices that we have today.

Aspects of the history of building technology have received increasing attention lately, but specific attention to technologies in British offices has been minimal. The common approach to technology focuses on development with little attention to application. Even when specific buildings are cited, it is generally because they are seminal: the first, or most celebrated. This is characteristic of the relevant chapters in A History of Technology, such as Jarvis's 'Distribution and Utilisation of Electricity' and 'The Generation of Electricity,' and Hamilton's 'Building Materials and Techniques.' Henry Cowan treats structure, heating and lighting in An Historical Outline of Architectural Science in much the same way, as does L. T. C. Rolt in Victorian Engineering. Two popularly written books, one by Lawrence Wright, Home Fires Burning, the other The Social History of Lighting, by William O'Dea, present perhaps the most comprehensive treatments of heating and lighting.

Siegfried Giedion's Mechanisation Takes Command is largely a catalogue-like compilation of inventions, but his classic Space, Time and Architecture stresses the relationship between technology and building design. Unfortunately British office buildings are omitted from these histories. Reyner Banham's Architecture of the Well-Tempered Environment also makes the connection to building design, but fails in its intentions to be truly representational of the technologies it presents.

Seminal Early Building Technologies by Robert Bruegmann in his concise 'Central Heating and Forced Ventilation:'
Origins and Effects on Architectural Design' which appeared in JSAH. 65 The final study worthy of note is Pedro Guedes's Encyclopedia of Architecture and Technological Change. 66 This is unique in its mention of British office heating and ventilation, but the treatment is brief and tentative. Analysis of structural issues is deferred to the more exuberant events in America, as might be expected in an encyclopaedia.

These modern works are valuable in the skeletal understanding of office buildings they offer, but considerable expansion and elaboration of this state of knowledge is necessary before the evolution of office buildings can be understood.

DIFFICULTIES AND DISCOVERIES

The very factors that gave office buildings their vitality make them somewhat elusive of accurate analysis. The difficulties encountered and discoveries made in this research merit brief discussion.

A large portion of this study relates building organisation to functional relationships, clerical work patterns, and office life in general. Unfortunately, reliable period documentation of the space needs of businesses does not seem to have existed. Except for a few isolated contemporary documents, research must rely upon inferences drawn from available plans and what little may be gleaned from modern sources.

There may be several reasons for this documentary oversight. The broadest explanation would be that office buildings are products of and for the middle class, and however important the middle class might have been to the development of the nation, it has never received the attention that the upper or lower classes have. Whilst
nineteenth century labour practices justified the attention of contemporaries and historians, and the lifestyle of the landed class has never failed to be interesting, the working life in business offices, a bastion of middle class respectability, has scarcely been recorded.

Gregory Anderson, whose *Victorian Clerks* is perhaps the most analytical of the few modern histories on the clerical professions, has similarly noted this cultural oversight. In 1908 a writer in *The Clerk* lamented 'to the 'man in the street' the offices of the clerk seem a glorious Arcadia...He sees...noble buildings...which are but splendid advertisements...To those behind the scenes, however, it is totally different.' Efforts at that time by the fledgling unions to obtain Parliamentary regulation of offices were ineffective, and it wasn't until 1963, with the Offices, Shops and Railway Premises Act that the government established controls over office environments.

House histories, written for and published by the larger of the banks, insurance companies, and manufacturers, offer great potential in the understanding of their operations but seldom offer much of substance related to buildings. They focus on the growth of their individual institutions, personalities of principals, and socio-economic life of the clerical staff but generally neglect physical environment, except for an occasional perspective of a facade.

Studies in business history and union organisation tend to concentrate on social and economic aspects of business, and the monetary gains made by clerks. They virtually ignore physical working conditions.

This void is not surprising. In fact the lack of modern attention to office working spaces reflects the almost complete lack
of attention given them by the Victorians and Edwardians. Except for J. W. Gilbart's highly influential *Elements of Banking*, there were virtually no Victorian books or pamphlets on office management, business organisation, or office space layout. This is rather surprising considering the clerical profession grew from less than 100,000 in 1851 to over 700,000 in 1911.

It seems, however, that the methods of running an office were something that was passed on within the closely knit trades, from father to son, from principal to clerk. Undoubtedly the scarcity of records can be related to the fact that so many businesses were small. Their records were either not written, were poorly kept, or were thrown away by ambitious housecleaners. It was not until the turn of the century, when the concept of professional management arrived in Britain, that the first books and magazines devoted to business organisation began to appear. Office building organisation then changed significantly.

Many records in the City of London were destroyed in the Blitz. The City of London Real Property Company, one of the oldest and largest office building companies, lost theirs this way. Fortunately one of their chief competitors, the City Offices Company, did not. Although their records are chiefly limited to minutes of board meetings, they have provided much valuable information.

The difficulty of researching business records is mitigated somewhat by the amalgamation of banks and insurance companies. Most of the British banks and some of the larger insurance companies have archives which contain records of parent companies and those that have been absorbed. The contents of these archives vary tremendously. Although much of their records cover information similar to house histories, they also contain good photographs of
building facades and occasional interiors, construction notes, and working drawings. Specific programme statements don't seem to exist. Two invaluable finds for this research were the virtually complete working drawings of J. MacVicar Anderson's Phoenix House, designed in 1913, and John Gibson's 1863 designs for the National Provincial Bank.

Another valuable resource is the RIBA Drawings Collection. The material related to non-facade aspects of offices is disappointingly minimal, but several important items are included, such as an unbuilt design of Norman Shaw's New Zealand Chambers.

An invaluable source for this study has been the drawing collection of Trollope and Colls Ltd., builders in London for two centuries. All extant drawings of buildings they built have been photographed on microfilm. The collection includes construction drawings of offices in the City as early as 1876, although the greatest concentration is of offices built after the turn of the century.

This study would have been tremendously hampered if it were not for a source that has so far been almost completely overlooked by historians: the insurance maps compiled by the Charles E. Goad Co. Their purpose was to record building qualities in the commercial centres of the major cities to assist fire insurance agents in accurately setting rates for specific buildings. For the researcher these maps provide unequalled information about building organisation. At 1" = 40', they identify site size and shape, building height, fire wall and lift locations, roof and floor construction, window and rooflight size, and occasionally facade materials. The maps were started in 1888 and were updated, sometimes with applied pieces, through the Second World War. They cover, among other cities, London, Manchester, Birmingham, Liverpool, Glasgow, and
Edinburgh. When so much contemporary and modern information related to office buildings is devoid of contextual description, the coherency that Goad's Maps provide is immeasurable. The British Library, the Guild Hall Library in the City and the LCC Offices contain various editions.

One last area of potential source material lies in fiction where office buildings occasionally were the settings. Dickens's works such as *The Christmas Carol* and *Bleak House*, are most notable. Dickens had spent his early years as a law clerk, and his descriptions of the Georgian offices of his youth can be loosely translated as exaggerated accounts of early Victorian offices. The same themes of dust and disorganisation were repeated in the 1897 novel *The Typewriter Girl*, in which the heroine escaped from the humdrum life as a 'typewriter' to join a semi-anarchist society. These books gave a negative impression of office life. They were countered by Thomas Armstrong's *King Cotton*, a recent novel centered in J. K. Colling's Albany Building in mid-Victorian Liverpool, in which office life was treated positively. This short listing accurately reflects the almost complete oversight of office life in general. To the extent that the descriptions are accurate they are valuable, but they certainly represent only a small portion of office life. The lurid descriptions of offices in the novels above could be countered by the extremely gracious working conditions in banks and insurance companies, which featured seven hour long days and well-lit, well-ventilated spaces.

Other aspects of office buildings prove to be equally elusive. Contemporary architectural periodicals provide the richest source material, and for aspects of offices in which they were interested, they are unequalled. Building facades and stylistic issues received
the foremost attention, while office building plans were a rarity. The Builder for example did not publish an office plan until twenty-three years after its founding. The Building News waited a decade. Victorian developments in structure, heating and ventilating, and building regulations can be traced, but only in general, for mention of these specific to office buildings is rare. Full frame construction was the structural issue of Edwardian Britain, but the magazines overlooked the preliminary City work in the late Victorian years. Office buildings were not officially recognised as a separate building type in London until the passage of the 1894 London Building Act. Product manufacturers, such as those offering patent 'fireproof' floors or 'warming' devices, were quick to point out the mansions and public buildings featuring their devices, but rarely took pride in the office installations, although use of both in offices was common.

Contemporary treatises on technical subjects have proved to be quite valuable to this research. As with the periodicals, many of these are not specific to office buildings. They accurately identify developments in their respective fields and, through correlation with other sources, assist in safely identifying office developments. Information on health science, warming and ventilation, fire technology and fireproof floors, 'Ancient Lights,' and building regulations are all readily accessible. It is disappointing that, except for Roger Harper's recent dissertation on building regulations, these subjects have escaped modern critical attention.

Recent analyses have primarily focused on stylistic issues, and for these issues they provide a good framework for early Victorian and Edwardian office buildings. The general patterns of response, the constrained physical contexts, and theoretical ideals to which
they responded have yet to be unraveled. A gap in modern research exists in the closing Victorian years, leaving the Free Classic offices somewhat ill-defined.

CONCLUSION

If this study takes on a catalogue-like character, the impression is appropriate. Office buildings in Britain are a complex subject, with many small and apparently unrelated factors, each adding a part to the total picture.

The evolution is a continuum, but a multiplicity of events and factors make the continuity difficult to express. The organisation of this study, with attention to form, services, structure and style, is intended to lend coherency without violating that continuum. As has been noted, the rapid changes that affected all aspects of office buildings at the turn of the century demand special recognition. To underscore the significance of these events, the main body of this study is divided into two main components: Victorian and early twentieth century. Whilst threads of continuity join them, the contrast of developments on either side of the century mark is emphatic.
PART I

VICTORIAN OFFICE BUILDINGS
Considerable change in office building form occurred during Victoria's reign. Much of it was constituted in many small events, none of which alone might merit attention, but which, when viewed together, had considerable impact on both office buildings and British cities.

The evolutionary development progressed through three major phases. In the early, transitional years, offices borrowed heavily on the forms already employed for similar uses. The limitations of these protoforms were soon evident, and within fifteen years office buildings entered into another phase. This mid-Victorian phase was characterised by rational planning and almost ruthless maximisation of building size. The pressures came from the rapid escalation of land costs and the limitations of stair access to upper floors. The lift was commercially available but its potential was not realised. By 1880, however, its impact was evident. With increased use of the lift, offices entered the third phase of Victorian development, characterised by rising building heights and intensified contextural problems.

In each of these phases the Victorian office building displayed an acute responsiveness to internal and external forces. The simi-
larity of response among many buildings is amazing. It is an attest to the competitive nature and severe constraints that characterised the design of Victorian offices.

EARLY VICTORIAN FORM, 1838-1855: TRANSITIONAL YEARS

Edward I'Anson, the most well-known of Victorian office building specialists, noted the first building specifically for office use in London was built in 1823 by an architect named Voysey. Prior to this offices were housed, like shops, in the ground floors of residences. It wasn't until Victoria's reign, however, that a noticeable number of offices were built. Even these were few in number and were poorly recorded.

Undoubtedly much of the need for office space was filled by conversions of houses and shops. John Tallis's 1847 views of Leadenhall Street and Cornhill, in the City, showed numerous second doors along the pavements indicating a letting of the upper floors separate from the shops on the ground. Undoubtedly these accommodations were of varied quality. Just as certain, they contained the lessons that were necessary for the full development of offices as a specialised type that was soon to follow.

Buildings built specifically for office use in the years up to the early 1850's contained striking resemblances to other building types. Available plans from the period reveal a deep debt to buildings ranging from shops and houses to the Bank of England.

The Phoenix Fire Office on Lombard Street had a shop-like plan in its 1838 building. Insurance offices at the time had a steady traffic of policyholders coming in to initiate, renew, or make payments on policies. The Phoenix general office was arranged with desk space for the clerks along the perimeter, the public in
the centre, and a counter employed as a writing desk between the two.

Banking had traditionally been a private business. Bankers' homes served as their offices. In the 1830's, however, joint stock banking was allowed in England. With it came a need for banking offices separate from houses. The offices, however, were very house-like.

One of the more successful joint stock banks was the National Provincial. After several years of steady growth in the provinces, it opened a head office in the City in 1840. It acquired Salvador House, a simple Georgian mansion on Bishopsgate, and commissioned John Burges Watson to make the transformation from a house to an office. Watson made simple modifications to the interior. Bank clerical functions required contiguous seating. Watson accommodated the forty clerks on the ground floor by removing a wall. (2-3) Accounting and waiting were allocated to other ground floor spaces, while principals' rooms and a clerk's residence were located above. All of these fit very well into the old house. The most visible aspect of Watson's design, however, was the building of two Doric lodges at the street, reminiscent of a Georgian park scheme and of Philip Hardwick's just completed entrance to Euston Station. (2-4) The gesture at once turned the house into a public building and placed its facade at the pavement line, where it competed very successfully with its high neighbours! (2-5)

A residential ancestry can be seen in buildings built specifically for office uses. Wigg and Pownall's Staples Inn Chambers, built in 1843 for solicitors' offices, was organised according to the pattern of a college at university. The building consisted of suites of chambers arranged around the landings of two stairs. (2-6) This pattern was to become popular for solicitors. Perhaps it was because
of the formal references to university life. No doubt it was encouraged by the first specific reference to office buildings in the London building regulations. The Metropolitan Building Act of 1844 required inns for the 'study or practice of the law' and 'chambers, offices, or counting houses' arranged around 'separate and distinct staircase(s)' to be separated with a party wall. 5

Terrace house planning principles can be seen in Edward I'Anson's Royal Exchange Buildings, built in 1844. 6 A Metropolitan Improvement Act, passed to enhance the locale around the Royal Exchange, eliminated Freeman's Court and created the building line that exists today. 7 I'Anson had already remodelled a building at the end of the court and was called upon to design the new buildings on land owned by three separate owners. This pattern of ownership can be seen in the final organisation. The 'buildings' were actually four in number, separated by fire walls, each with its own set of stairs to the offices above. (2-7) The inefficiencies of so many stairs serving such small offices above must have been apparent even in 1844. The office sizes, with none larger than 1,500 square feet, indicate the limited space needs of contemporary businesses. The building toward Cornhill was no more than a pie-shaped sliver, measuring twelve feet at its greatest width.

The relationship between this terrace house organisation and separate ownership of properties is obvious. But the argument for the house as the protoform is made more compelling through two additional examples; one built earlier, one later. John Soane designed a row of office buildings for the Bank of England, to be let to private tenants. (2-8) Built in 1807, they predated Voysey's building by fifteen years. From the front on Princes Street they presented a single composition, with free standing terminal columns
and doors positioned and detailed to reinforce the unity of the group. As Goad's Maps indicate, however, they were five completely separate buildings, each organized around stairs, separated by fire walls. On the rear side, they featured projected semi-circular bays, much like the dining room treatment of a West End house.

Near the Temple end of the City, Hodgeson's Buildings, (2-9) designed in 1855 by John Knowles, Sr., had a similar arrangement. The facade featured three regular rows of arched windows, even more repetitious than those of I'Anson's Royal Exchange Buildings. They belied the fact that the building was really three separate buildings, divided by firewalls.

Only speculation can account for the reliance on the terrace house form. Concern for fire safety, demand for small offices, or perhaps simply tradition may be the justifications.

Reliance on the house prototype is evident in C. R. Cockerell and William Tite's 1838 design for the London and Westminster Bank. Located on Lothbury, the design also borrowed from the Bank of England across the street. The young joint stock bank was the first to build new premises in the City. At the time, joint stock banking was new in England. Until the Bank Act of 1826, banking was limited to partnerships with no more than six principals each. With the act joint stock banks were allowed, but not within a sixty-five mile radius of London, thus protecting the monopoly enjoyed by the Bank of England.

The 1833 Bank Act removed this restriction. The London and Westminster was founded the following year, with James Gilbart, later to be most influential in bank design, acting as manager.

Perhaps in an effort to achieve instant respectability, or in
a competitive gesture, the directors selected Cockerell, at the time the architect to the Bank of England, to design their building. Sir William Tite also participated in the design, perhaps only on the interior. Cockerell gave the London and Westminster a facade with a ruthless solidity that held its own against the bigger Bank buildings. Behind the facade was an office building which in essence was a large, centre entry, timber floored house, (2-10) with a fragment of the Bank of England behind.

The formal reference to house planning may have been almost predetermined. Private bankers maintained their businesses in houses, with, as Pevsner notes, the 'business rooms on the ground floor right and left of the entrance and the manager's living quarters above.' Hoare's Bank on Fleet Street, designed by Charles Parker in 1829 was, for example, designed this way. A thirty-eight foot long centre entry separated bank offices from those initially let to solicitors, and later used as expansion space. This entry led to the banking hall. A contemporary noted it was 'unequalled in importance by anything of the kind in London, except in the case of the Bank of England, and in altitude exceeds even them.' The room was only 34 feet square, but more than 59 feet high, and domed as in Soane's work across the street. The effect must have been increased by the long walk through the front building.

Its impact on future banks was immeasurable, although few were ever to measure up to it in purity of form, clarity of statement, or directness of reference to the Bank of England. The design was to be a transitional one. As the City grew, natural light became more precious. The space requirements and planning limitations of a single volume as high as this, blocking windows above, became an extravagance that even banks could generally not afford.
The reliance on prototypes suggested by these examples is the strongest single characteristic of early Victorian offices. Whilst there is no evidence to suggest that buildings such as these were inappropriate for their uses at the time of their construction, the substantially different pattern of office buildings that was to emerge over the next several decades suggests that the approach had serious limitations.

**MID-VICTORIAN FORM, 1855-1880: BUILDING RATIONALISATION**

By the 1860's the office building had come of age! Demand for office space stimulated by the Limited Liability Acts of 1855 and 1862 brought about extensive rebuilding of the City. Offices crowded out residences and even ground floor shops. Design in the City responded to restricted natural lighting and ever increasing land values. Architects maximised leasable area through rationalised building plans and by completely covering their sites. The London office building pattern was later to be repeated with minor variations in cities across the country. The major differences between the physical layout of the City and those of provincial cities was in the irregularity of London's street pattern, the narrowness of its streets, the multitude of pedestrian passages, and the large overall size of some of its blocks. These factors created a building context that was also constrained by geometry and easements, but which occasionally allowed giant buildings and unique opportunities for efficient office planning.

The principles developed in London were extended, on a smaller scale and with fewer circumstantial factors, in office buildings built later in cities such as Liverpool, Manchester, Edinburgh and Glasgow. Liverpool and Manchester office buildings also displayed...
additional variations. In Liverpool, the pre-eminent port of the nineteenth century, a combination office and sample room building was developed. This was later used in Manchester. Unique to Liverpool was the glass enclosed courtyard.

The mid-Victorian office form lasted until about 1880. Building developments are important for their recognition of office functional needs as well as rational planning. It is instructive to trace developments in the City, for no where else in the country were the problems so evident or the monetary stakes so high. The buildings were visible records of the tangled web of legal problems characteristic of the Victorian centre city.

Contextural Forces

Some of the most important forces bearing on the design of office buildings in the mid-Victorian city related to physical contexts. The two most influential of these were the constantly escalating land values and the developing state of case law related to natural light easements, commonly called the 'Laws of Ancient Lights.' They created opposing pressures: the first tended to demand higher and more intensive buildings, the latter restricted height and controlled overall shape, sometimes with ungainly consequences.

The Bank of England had been located on its present site since 1732 at approximately the centre of the City. By the 1850's its presence created a centre of office demand that caused adjacent land to be more valuable than anywhere in the country, and perhaps the world. (See Appendix 1) The management of money was the primary purpose of offices around the Bank. The need for daily communication among principals and the laborious process of transferring account
balances made a location here a prerequisite for the larger banks and insurance companies. Cornhill and King William Street, to the south and west of the Bank, were prime locations for insurance companies. Lombard Street, just south of the Bank, became a street of banks. Insurance companies and banks were not restricted to these streets; they could be found in great numbers within a few minutes walk in all directions from the Bank. Nor was a location near the Bank desirable to only these institutions. Offices to let were built over and behind the public offices, or in separate buildings, often above the few remaining shops that could still compete with the powerful money managers for ground floor space.

Other areas of the City were the centres of different office uses. Shipping offices were located on Fenchurch Street. The colonial trade was concentrated around Mincing Lane and Great Tower Street; the corn trade near Mark Lane. Office space for these trades was readily accommodated in offices to let, often in conjunction with display rooms. Lawyers, barristers and newspapers located near Fleet Street and the Inns of Courts. 21

The development of Westminster on land leased from various estates is well known, 22 but the extensive land lease system in the City is not generally appreciated. Whereas West End practice resulted in highly ordered design through restrictions and large scale developments, City practice contributed to disorderly development. There were few large land owners; instead, property was controlled by a patchwork of individuals and groups, including the Livery Companies, the Church Commissioners, university colleges, joint stock companies, shop owners (even long after their shops were superceded by offices), private individuals, and executors of estates. Property was generally leased at fixed rates for decades, often as long
as 40 or 60 years. As land leases fell in, the ownership of the buildings passed to the land owners. With the City developing rapidly, long rental agreements usually meant property value had escalated substantially by the end of the lease. The new lease, calculated with an allowance for future escalation, could be substantially more expensive. For example, part of the land on which I'Anson's Royal Exchange Buildings were built was leased for £1396 per year, but when the lease was renewed in 1881, the rate was almost tripled to £3500 per year. Land for an office on Old Swan Alley was let for £260 per year in 1838, but the rent increased to £1025 per year when relet in 1866. Increases such as these forced rebuilding with larger buildings.

The land ownership pattern was erratic. Any street might contain literally dozens of properties, each owned by separate landlords and leased to different building owners. Interspersed with these were freehold properties. A freehold might be eventually leased, or a leasehold could be converted to freehold. It was rare in the City to find the leases of large amounts of contiguous properties terminating at the same time. Two important exceptions were Moorgate Street and King William Street. Both streets were created by metropolitan improvements in the 1830's. The building sites thus created were leased for approximately uniform periods, which resulted in consistent rebuilding in the early 1900's.

Another problem was that of assembling adequately sized and shaped properties for new buildings. The City land pattern was based on Elizabethan building sizes, but even by the early Victorian years these were too small for new offices. Properties for new buildings had to be created by assembling several contiguous parcels. The process of accomplishing this became a matter of negoti-
ating leases or freehold purchases from several different owners. Palmerston Buildings, for example, was built on land assembled in the 1860's. One section of the property was freehold, but the remainder was land leased from three separate landlords.25

Some buildings were built bearing a permanent record of such land transactions. A small office building in Crown Court, for example, designed by Edmeston and Son in 1875, had its facade subdivided by a pier in an awkward asymmetrical manner. (2-12) The pier was the end of a brick bearing wall located on the property line of the separately leased plots. The leases terminated at different dates; one side could be torn down without affecting the other.

Property that was critical to the assembly of a large parcel could command almost extortion-like prices. For example a 1,600 square foot parcel on the corner of Threadneedle Street and Finch Lane, diagonally across from the Bank, was let in 1855 for £1000 per year. Ground rent, calculated on twenty-five or thirty years purchase, equated to an astronomical £840,000 per acre!26

For larger single properties, land value was not so great but could still be considerable. In the same year the Australasian Bank paid an equivalent of £448,000 per acre purchase price in ground rent; the Imperial Insurance Company paid £600,000. Both of these properties were across the street from the Bank on Threadneedle Street. Further away, down Cornhill, the County Fire Office was willing to pay an equivalent of £470,000 per acre.27

Land value had several implications for office building development. The first was that building cost was far exceeded by land cost. One contemporary observed that land cost was three quarters of the total building and land cost.28 For properties around the Bank even this could be conservative. Edward I'Anson's reported figures for
the Colonial Insurance Office on Lombard Street, built in the 1850s, suggest that the building cost was only one eighth of the total cost. Building construction costs per cubic foot didn't vary considerably from street to street, but land values did. A tenant was renting a location considerably more than he was renting a building. The high cost of land made building materials comparatively cheap, a fact which was reflected in the exuberant display of expensive carved stone on offices near the Bank.

At the same time, land costs placed unusual pressures on architects to maximise the amount of lettable space within each office building. This requirement became one of the most important goals in office design. It had to be achieved, however, while still meeting office functional requirements, such as the need for adequate natural lighting. The inherent conflict between the goals of maximised space and maximised light formed the basis for much of Victorian office design.

The other factor which had substantial effect on the design of offices in the English Victorian city was the accumulated 'Laws of Ancient Lights.' Their basis was in English custom. Building height and plan arrangement were unrestricted unless they interfered with the passage of natural light to the windows of neighbouring properties. In order for a window to claim such an easement, it had to be an 'ancient light.' The definition of 'ancient' varied. At times it meant in existence for as long as could be remembered, in existence in the reign of Richard I, or since time immemorial. In practice the laws had little effect on building development, as few windows could date back far enough to be the basis for claims. The definition of 'ancient' was dramatically changed, however, following the passage of the Prescription Act in 1832. It established
that a twenty year period was sufficient to establish rights previously gained through prescription. The Prescription Act covered a number of customs, and apparently few in Parliament were aware that the Prescription Act might apply to 'ancient lights.' There was no recorded discussion about them, or of possible implications for city building when the act was passed. Indeed, absolute certainty that the Prescription Act could be applied to questions of 'ancient lights' was not established until a court decision confirmed the act's application. It was said that in practice the new laws had very little effect until about the mid 1860's. Prior to that time the courts took a broad view of mounting urban pressures and favoured the 'servient' owners, those of new or proposed buildings. But 'by the zeal of two Vice-Chancellors' in 1865 and 1866, the law began to be interpreted in favour of 'dominant' owners, those claiming 'Ancient Lights' rights. This hardening of judicial attitudes occurred in the midst of a London office building boom. It intensified the arguments on servient owners' behalf, and heralded several decades of uncertainty due to subtleties of interpretation and measurement. As case law, the 'Laws of Ancient Lights' were in a state of continuous change through interpretations in the courts. Each legal decision could become the precedent for future decisions. They were subject to the complexities of property and ownership patterns, the persuasive arguments of architects and surveyors and the personal inclinations of the Chancellors.

Expert witness testimony and professional advice were constantly in demand by owners, initially to help determine building rights, and for years afterward to protect their rights from encroachment by others. No land owner, building owner, or practitioner could ever be absolutely sure of his property rights. The Builder in 1864 commented
the law of this question can be understood by nobody.\textsuperscript{36} The changing state of the law was the constant subject of lectures and books, with regular revisions. The bibliography of the 1895 edition of John Gwilt's Encyclopaedia of Architecture, for example, lists seven books on the 'Ancient Lights,' and an additional nine more on easements, arbitration, and compensation.\textsuperscript{37}

The essential points remained constant. Easement rights could only be obtained for windows; open land, or solid walls, had no rights. Rights could only be acquired for light, but not for view or air. The rebuilding of a wall could place accrued rights at risk. Rights could be retained in rebuilding only if the windows were re-constructed in their original location, and if the wall plane matched that of the original. Ownership of two properties by one owner negated the rights one property might have over the other.\textsuperscript{38}

However many issues remained in dispute. Among these were methods of the exact determination of the twenty year period, methods of measurement when the proposed obstruction was not parallel to the 'ancient light,' and determination whether occupations dependent on high illumination levels could claim more rights than others.\textsuperscript{39}

By far the greatest difficulty in lights cases was that of predicting, or assessing, damage to dominant owners' property. Servient building owners could notify dominant owners of their building plans and attempt to negotiate a settlement before they began to build, or they might start building and hope to reconcile their differences through negotiation or through the courts. Speculating building owners were accused of employing this latter tactic to take advantage of less aggressive neighbours. Since lawsuits were expensive and lengthy, a dominant owner might be intimidated by the pressures of impending construction to settle disputes privately.
The dominant owner had to prove 'substantial interference' in the courts; in a private agreement he could settle with greater certainty of some gain. Another course was for owners to agree to abide by the judgments of arbitrators. There was a legion of office specialists ready to perform such services. I'Anson, for example, seems to have been as busy as an arbitrator as he was as an architect. 40

The basis of many of the problems in lights disputes was the difficulty of accurately measuring natural light. The practical photometer wasn't available until the early twentieth century, so Victorian 'Ancient Lights' settlements were based on a little theory and a lot of experience. Expert testimony, although extensively relied upon by the courts, was often inconsistent. It was commonly noted that two experts would swear in court completely opposing conclusions, each basing his judgment on 'years of experience.'41 The problem was aggravated by the time period required for building. Once constructed it was difficult to account for the amount of light existing before construction. Conversely, it was difficult to accurately predict light diminution, particularly when a good proportion of available light might be reflected from surrounding wall surfaces. 42

In the absence of suitable testing devices, a number of theories were proposed to assist in predicting lighting levels. Among the earliest of these was one proposed by Robert Hesketh in a lecture at the RIBA in 1852. 43 Hesketh attempted to place numerical values on lighting levels in interior spaces, and showed through example a great range of lighting levels in different situations from a single unit of window area. Hesketh's contribution was the concept of considering the sky surface as a uniform hemisphere, with no recognition of compass orientation. This was a response to the generally overcast
weather conditions and the need for sufficient lighting regardless of unfavourable conditions.

Hesketh's uniform sky concept was subsequently divided into segments by Wyndham Tarn, who employed them as a basis for mathematical calculations. Both Banister Fletcher and Robert Kerr used a gridded sky to reduce the subjectivity of light measurement. Kerr, for example, assigned each square a lighting value related to its position, with adjustments if lighting from one direction was deemed important for a particular use. The degree of obstruction from a proposed building was predicted by comparing the number of unobstructed squares with the number needed for adequate lighting as determined by observations in existing spaces. But sophisticated methods such as these were not favoured in the courts, Kerr complained.

Direct evidence, the plain story of the people who described what they had seen with their eyes, heard with their ears, was naturally esteemed to be infinitely better than mere calculations of those who arrived at their conclusions by speculation.

Many other architects, surveyors, and judges relied on less sophisticated approaches. The most common one assumed that an easement plane projected at a forty-five degree angle from a dominant window sill would guarantee adequate lighting levels. This rule of thumb, said to be based on the 1862 Metropolitan Management Act, had simplicity as its primary virtue. Its consequences of limiting heights on expensive city sites, however, could be significant. Kerr, among others, dismissed it as erroneous, but it remained a standard measure throughout the nineteenth century.

While architects and other interested parties argued over the specific points of law, few wished their abolition. The major problems stemmed from the uncertainty of the laws. Rule of thumb
and expert witness were the primary bases of legal decisions. Inconsistent judgments from independent courtrooms made no coherent pattern of judicial opinion. To quote Kerr again:

The great grievance...was the total uncertainty of the result of legal proceedings...The law was constantly changing. The judges were so entirely uninformed upon the practical points involved in proceedings of this kind, and confessed so, that each successive judge who had a case of ancient lights before him looked at it in his own way, and applied his own common sense to it, giving but little attention to the common sense of previous decisions.50

Most of those involved upheld the principles of the laws, which were believed to be 'fair and equitable, and well fitted to do justice to all parties.'51 There were calls to rewrite the mechanics, including one from I'Anson, but no constructive alternatives emerged. The problems were overshadowed by the sense of justice that prevailed. This was summed up by office specialist T. Chatfield Clarke at an AA lecture in 1877:

We stand in a position of equitable jurisdiction, not to allow such questions to be made the means of extortion on one side, or not adding to the value of any adjacent property in the course of reconstruction at the expense of the owner of the ancient lights adjoining. It cannot be denied that this subject requires much care, in the construction of a modern building, but each case rests to such a considerable degree on special conditions, and it is hard to see how any general law can be found applicable to such cases which may not practically do an injustice.52

If the laws eliminated some injustices, they certainly added to the consternation of architects during the design and construction process. One building noted by Clarke was threatened with eight separate lawsuits.53 Dominant owners were accused of extortion in negotiating settlements under the threat of injunctions.54 C. Somers Clarke's General Credit and Finance Co. Building on Lothbury, much admired by modern critics for its literal Ruskinian facade,55 was one such case. Construction was stopped by an injunction; the build-
ing was occupied in a partially finished state while the courts settled the question of how many storeys the building could be. The City Offices Company's St. Clements House, Birchin Lane, designed by the Francis brothers, was initially to be a four storey building, but was stopped at the sill line of the top floor. Despite the company's willingness to 'pay almost any amount of compensation to the owner of the property on the opposite side of the street,' the building was roofed over at that height. The awkward corner of C. J. Parnell's London and County Bank extension on Lombard Street (2-13) at Nicholas Lane in 1875 followed exactly the line of settlement negotiated with Albert Grant, a property owner across the street.

Perhaps one of the architecturally consequential 'Ancient Lights' settlements, and certainly one of the few which resulted in a memorable and graceful building design, was that which controlled the rebuilding of the National Provincial head office, on Bishopsgate, in the early 1860's. John Gibson received the commission in early 1862; construction commenced in the summer of 1863. The building was stopped, however, at the foundation line while 'Ancient Lights' settlements were negotiated. The finished building speaks as much for Gibson's ability as a negotiator as it does for his ability as a designer. The curved pedimented Corinthian facade resulted from negotiations with the City over the location of the building line. Its height and that of the building as far back as the original Salvador Mansion were limited by the rights of the South Sea House to the west. The major constraint was a ground floor window utilised by the Baltic Sales Room. A forty-five degree angle projected from the sill of this window established a plane which restricted the maximum height of the party wall to
about twenty-five feet. (2-15) This proved to be insufficient room for more than one floor. Gibson was able to extend his banking hall to a twenty-seven foot height, just barely adequate for the fifty foot wide, 120 foot long office, only through the clever introduction of a large cove and some expedient iron framing. (2-16)

For all practical purposes this easement envelope did not vary much from that defined by the earlier Salvador Mansion. (2-17) The southern edge of the multi-storey office block was within a few feet of the old front facade line. What Gibson accomplished in this building was not a clever increase in the volumetric potential of his site, but rather something more characteristic of the Victorian middle years: an intensification of use through maximum development of the buildable area. To his lasting credit it was done with unusual gracefulness.

'Ancient Lights' acted to hold building height down whilst land values created pressures for larger buildings. Squeezed between these opposing contextual forces were internal forces related to newly defined office functions.

Functional Forces

The overall organisation of office buildings changed consider-ably during the mid-Victorian years, partly in response to the growing awareness of the functional requirements of office work. This awareness seems to have been a new one, for it is not evident that it influenced earlier office buildings. Of the different office uses, the most explicit functional demands developed in joint stock banking. Other offices, particularly offices to let, changed in organisation as well, but unfortunately without much written, or
The most reasonable categorisation of functional requirements is one based upon the sizes of working spaces, rather than on the particular office use or the leasing arrangements within office buildings. In the nineteenth century the primary difficulty in organising office work spaces was related to their extreme dependence on natural lighting. The design of large work spaces was considerably different than that of smaller ones. The functional needs of different types of office work played an additional role in office organisation which, while less significant, can be seen in subtle variations among similar uses.

The development of the banking hall form as a significant public interior space is one of the more memorable architectural accomplishments in the Victorian office building evolution. The consistency in size and grandeur in these halls all across the country is perhaps as remarkable in itself as are some of the finer individual examples.

Much of the credit for this display must be attributed to James William Gilbart. Through writings and example, no other Victorian contributed more to banking hall design theory than he. Gilbart, as manager of the London and Westminster Bank, must have been instrumental in directing Cockerell and Tite in the 1838 design of the precedent setting main office. More important, however, were his writings. His primary architectural effort was included in The Elements of Banking, an encyclopaedic work, published from about 1850. 'Gilbart on Banking,' as it was known, became a standard work on the subject and, through subsequent printings, was widely circulated and read for decades. The Builder even published sections on bank hall design. Gilbart argued that 'the office...must...be fitted up in
the way that will most effectively promote the end in view. And here there are three points to be considered - space, light, and ventilation. His elaboration on these points is so concise, and so succinctly describes some of the functional requirements of banking work, that portions bear quoting at length:

A chief consideration is space. A banker should take care that his clerks have enough room to do their work comfortably. Every accountant knows that he can often work faster if he can have two or more books open at the same time; but if his space is so confined that he must shut up one book, and put it away, before he can use another, he will get on more slowly. The cashiers too, will be impeded, if they are obliged to stand too close to each other; and the public will be huddled together, and will often count incorrectly the money given to them, and thus take up the cashier's time to put them right. Want of space will necessarily occasion errors, from the confusion it produces, and from one clerk being liable to interruption from the noise or vicinity of the others. A banker should therefore take care that his office is large enough for business; and that it will admit of being enlarged in case his business should increase. Ample space is also conducive to the health of the clerks, as there will be more air to breathe, and the atmosphere is less likely to become polluted by the burning of lamps and candles.

Another consideration is light. It is well known in every London bank, that fewer mistakes are made by the clerks in summer than in winter. Abundance of light prevents mistakes, and saves all the time that would be employed in the discovery of errors. Light is also of great importance to the cashiers in detecting a forged signature and bad or counterfeit money. Thieves are also less likely to attempt their robberies in a light office than in a dark one. Faint or illegible handwriting can be more easily read, and hence mistakes are less likely to occur. The clerks, too perform their duties with more quickness and cheerfulness. The gloominess of an office throws a gloom over the mind; but 'sweet is light, and a pleasant thing it is for the eyes to behold the sun.'

The lightest part of the office should be devoted to the clerks. We have observed sometimes a violation of this principle. The entrance door has been placed in the middle of the front, with a window on each side and the counter thrown across the room, so that the lightest part of the office has been given to the public.

It is better that the entrance be placed at the right or the left corner, and the counter be made to run from the windows to the opposite wall. The light will thus fall
lengthways on the counter and the space behind the counter will be occupied by the clerks.\textsuperscript{66}

In a later edition, Gilbart urged that the ledger clerks be placed immediately behind the tellers, so as to facilitate communication in cases of doubtful cheques. Additionally, clerks were to be seated facing the counter, so as to discourage any 'dishonest person...standing at the counter...watching (for) an opportunity of committing a robbery when the cashier is engaged.'\textsuperscript{67} Gilbart noted, however, that this arrangement would be dependent on the direction of light. 'The clerks should not have their faces or backs towards the window, but the light should fall on them sideways.' The last functional dictate called for the chief clerk to be located in a position to see the entire office.\textsuperscript{68}

Victorian banking halls, or 'offices' as Gilbart refers to them, were intended to be efficient and healthy working places for the numerous clerks required in an industry dependent on ledger books and hand calculations. The sensitivity toward functional efficiencies seems to have initially been the domain of the joint stock banks, but became accepted by private banks as the century progressed. The requirement that tellers be close to clerks, and that clerks all be under the eye of the head clerk, resulted in the common banking hall arrangement of a contiguous block of desks covering most of the available floor space, and placed under the best available natural light. It helped make banks ideal working places.\textsuperscript{69}

Whilst the most memorable image of a Victorian banking hall is that of a large generous public space, in reality the spaces were quite the opposite. In many plans no more than one quarter of the floor area was devoted to the public. It was generally the most poorly lit part of the space.\textsuperscript{70} The generous public image was largely
visually borrowed from the space for the clerks. It is certain that this expressive benefit was never overlooked. The published drawings of John Gibson's National Provincial head office, for example, showed the main space completely devoid of clerks while in reality over 200 people worked within, and the public was given only a narrow passage along one wall. (2-18)

The impact of Gilbart's ideas can be seen in a branch of the London and Westminster Bank, designed in 1853 by Henry Baker, the winner of a limited competition. Baker was noted to have 'avail-ed himself of various useful hints in Mr. Gilbart's 'Prize Essay on Banking'...in the general arrangement of the business depart-ments.' The building was built, and still remains, on High Holborn facing Southampton Place. It was said to give 'an impression of ample space, abundant light, and proper ventilation.' The limited site size required the manager's residence be placed above the banking hall, precluding a top lit arrangement such as Cockerell and Tite had employed on the main office. Baker, however, made formal re-ference to that earlier building in the circular shape of the walls enclosing his banking hall. (2-19) What he couldn't achieve in section he suggested in plan. Natural lighting was provided by the large north facing windows and a series of roof lights located in the third bay from the windows.

Baker employed what Gilbart suggested, and what was to become characteristic of most banks: the side entry. Here this function-ally responsive location contradicted the general shaping of the space. A centre entry would have been stylistically more correct by supporting the axis suggested by the wall shape. Unfortunately no record of Baker's counter and desk arrangement seems to have survived, but almost certainly the public passage was restricted to the
left hand side of the space, with the counter running perpendicular to the window wall at approximately the pier line. This would have given the clerks, if facing the counter, light from their right and left sides. Baker followed Gilbart's dictum of providing as uninterrupted view as was possible within the space by utilising thin cast iron internal columns to support the floors above. Indeed, thin columns became such a common response to this problem that solid cast iron columns were specifically manufactured for bank purposes until the turn of the century.

Another response to lighting priorities can be seen in F. W. Porter's design for the Chancery Lane branch of the Union Bank of London, 1866. Apparently for reasons of access and prestige, Porter placed his entry in a traditional City location, at the street corner. Since this blocked the best lit portion of the space, he placed the clerks along the street window wall and extended the public passage behind them along the more poorly lit party wall. He, like Baker, employed columns of the thinnest possible section.

Such concern for lighting was not limited to restricted City sites, as was evident in a letter to The Builder from 'A Country Architect' in response to a bank design which won The Architectural Association Medal in 1885. The writer was shocked that the waiting room and the banking hall - functions vastly different in size and lighting needs - would be illuminated by windows of equal size. Additionally, he pointed out that

Not only is the light in the bank poor, but it is badly distributed. The half of the counter nearer the fireplace would get very little light; besides, what light there is, is wrongly placed. The clerks want it full on their books and on the counter; still more should there be good light on the faces of the customers. When a stranger presents a cheque, the cashier looks hard at him. If there is any-
thing wrong, a good light may discover it at once.

Critical functional requirements and the general ease of lighting spaces from the street front made the banking hall with a side entry and a counter perpendicular to the street perhaps the most common pattern for Victorian banks. Even private banks, which gradually assumed the forms of joint stock banks so as to be indistinguishable, followed this pattern. Only the availability of good top lighting, or unusual siting circumstances, presented opportunities to do otherwise. In some cases, the compelling factors for this type of organisation were in conflict with the symmetrical goals of the facade design, and architects were forced to compromise their ideals. The results were some characteristically Victorian building designs; these will be discussed later as issues of style.

Insurance offices also followed many of the principles outlined by Gilbart. Unfortunately, there was no equivalent spokesman in the field of insurance; analysis must be restricted to observation of examples. Insurance companies often had public spaces that rivaled banking halls in size, but the nature of their office work was such that they did not share the bank's need for contiguous clerical spaces or for lighting on the counter. Many offices were organised in the manner of banks, with a side entry and counter perpendicular to the windows, but many others followed an organisation denigrated by Gilbart: the centre entry. The Westminster branch of the Sun
Assurance Company designed by Charles Freeman in 1867 was of this type, (2-22) and in general arrangement was quite similar to the 1838 Phoenix plan mentioned earlier. The primary difference, however, lay in the arrangement of the clerical desks. These were overlooking the counter as suggested by Gilbart and not facing the wall in the shop-like manner of the Phoenix.

F. W. Porter's remodelling of C. R. Cockerell's Sun Assurance head office in 1888 showed as much sensitivity to lighting requirements as in his Union Bank. The main entry in Cockerell's 1843 design had been at the corner; the building otherwise had been organised like a centre entry house. The centre stair led to a secretary's residence and board room on the first floor. Porter removed the office entry and relocated it at the point of the former residential entry, a position of much less light. (2-23) The subsequent interior office arrangement followed the best in banking practice, with the public corridor along the inner wall, and clerical desks perpendicular to the window wall. (2-24)

These examples illustrate the primary organisations and critical issues of lighting in the functioning of large Victorian offices. It is evident that natural lighting was the predominant concern. Ventilation and adequate heating were critical issues as well, but were accommodated by adequate ceiling heights and rudimentary services,
not by the organisation of the work space.

Whilst the large public offices were the most memorable spaces in Victorian office buildings, they were far outnumbered by the ordinary spaces housing common clerical tasks and the ever growing numbers of small private companies. Such spaces, the staple of buildings built expressly for letting, also filled the upper floors of banks and insurance companies, where they might be let or used to serve clerical needs accessory to the ground floor offices. Private businesses in the nineteenth century were relatively small concerns. Anderson notes that the small counting house was the most common Victorian office organisation. The average number of clerks in an office in Liverpool for example was only four.83 I'Anson considered an office suite of eight rooms to be 'large and commodious.'84 With businesses as small as these, functional needs were reflected primarily in the character of the spaces and furniture arrangement rather than spatial relationships.

The documentation available on functional needs of large office spaces seems minimal, but it is abundant when compared to that of small offices. Research must rely on the analysis of building plans, on some rudimentary theories related to illumination, and on equally basic contemporary thoughts on environments for writing tasks.

Abundant natural lighting was the most important requirement of small offices. It was greatly facilitated by the drastic drop in the price of plate glass after the repeal of the Glass Tax in 1846.85 As restrictions on window number and size were removed with the repeal of the Window Tax in 1851,86 glass quickly became a common wall treatment for offices.

The most succinct explanation of lighting needs in small offices was given by Edward I'Anson in his presentation of his own work at
the RIBA in 1864. 87 I'Anson's presentation was comprehensive, covering room size, property values, construction methods, and 'Ancient Lights' in addition to lighting needs. His concern for the last issue was so great he designed buildings with walls virtually all glass. Colonial Chambers on Fenchurch Street, (2-25) for example, caused some concern in The Builder, when it was cited for an apparent violation of the 1855 Metropolitan Building Act. His window openings exceeded the MBA limit of no more than half the total wall area. 88 The facade, an ungainly affair with cut stone and cast iron in a loose Venetian-French composition, was legal only by I'Anson's counting the wall below the pavement as part of the total external wall area. His ruthlessness in reaching for every available ray of dim City light led to the use of fixed or pivoting sash in favour of the more common double hung window, and the use of bulkheads at each floor line to raise the window heads another two feet. 89 This last measure was important because it added several feet to the depth light could penetrate into the offices. Surprisingly, for all the efforts in gaining window area, I'Anson's office spaces were very small. Seldom more than fifteen by twenty feet in size, they were often further subdivided. The Colonial Chambers offices were extremely narrow, measuring at the most twelve feet in width. (2-26)

Others also focused attention on the lighting qualities of windows. Robert Hesketh, a City architect, proposed to the RIBA in 1852 a system of mirrored horizontal, movable reflectors placed at regular intervals between window jambs. He claimed at least one installation of his reflector system; patented systems by others followed later as remedial fittings. He also argued that different types of glass should be studied for their light transmission at
different angles of incidence. Light transmission studies followed, but there seems to be no evidence of implementing their results in office buildings. Another suggestion for lighting enhancement came from Dr. David Brewster, an Edinburgh physician, who suggested that muslin or ground glass at the opening would project light further into interior spaces than ordinary window glass. Samuel Knight added stylistic overtones to the issue: he argued at the RIBA that the Italian style was most appropriate for business uses because its square heads allowed more light in interior spaces.

The general availability of I'Anson's address to the RIBA has made him the standard source on small offices, but I'Anson must be considered as an extremist in his efforts to maximise lighting. Few of his peers seem to have given details as much attention. The raised bulkhead was common for basement spaces but not above the ground floor. Fixed glass seems rarely to have been used. T. C. Clarke's rear elevation of the Royal Bank of Scotland, Bishopsgate, was representative, employing double hung sash with exposed iron lintels. (2-27)

I'Anson's office spaces, as previously mentioned, were extremely narrow. Goad's Maps of 1888 indicate that a more common City office depth was closer to fifteen feet. The Francis brothers, experienced City architects, with spaces over twenty feet deep in several designs for the City Offices Co., produced perhaps the deepest offices.

Adequate lighting required office spaces to be very shallow, with only small variations. This was a major distinction of offices, one that quickly separated them from houses, and established them as a separate building type. A fifteen foot depth was considerably shallower than the twenty-four feet typical of the Georgian house. It was closer to the dimension of the third-rate houses common in
the City. Perhaps the early years of house conversions impressed upon architects the benefits of this depth.

Evidence of internal arrangements within these small offices is even sketchier than that of the office dimensions themselves. I'Anson's only comment was that space near the windows was always allocated for desks, even if windows were difficult to open as a result. Robert Kerr discussed the issue of desk arrangement in his Gentlemen's Country House. It is perhaps unusual to look at such a work when analysing office spaces, but it seems to be the first Victorian effort giving attention to the planning needs of office tasks. Kerr was discussing the design of a study:

The student should sit comfortably at his desk as regards fireplace and door, and have the proper benefit of a front left light. It is perhaps perfection to have at his back a blank wall covered with the bookcases, on his left a window, on his right the fire, and in his front the door.

This 1865 specification for the lighting direction is particularly noteworthy. It was fifteen years before the school authorities understood the importance of lighting direction. It is quite likely that Kerr's lighting thoughts were common among other architects and surveyors in the City, where he was an active figure. His ideal solution suggested a free standing desk in the centre of the room. This arrangement would have consumed an unnecessary amount of space, but probably was used in managers' offices. The average clerk was more likely to have worked at a desk arranged such as those in the Phoenix offices. These photos show the upper floors of the 1838 building, taken just after the turn of the century. The maximum number of clerks were seated along the windows, with counters, files and storage along the internal wall.

Due to their small size, the modest number of clerks to be accommodated, and the strong functional organisation related to light-
The requirements of small office spaces seem easy to understand. But they were not, however, easy to satisfy. The goals of good office accommodation and maximum site utilisation were always in conflict. The needs of small offices were to remain relatively constant through the century, whilst pressures toward site intensification continued to mount.

The general proportions and planning characteristics of both large and small offices established by the mid-Victorians remained viable until the end of the century. A more important contribution to the evolution of offices was the development of overall building form.

Building Planning

By the time Edward I'Anson delivered his lecture to the RIBA on office buildings, limited liability for joint stock companies had been available for almost ten years. For banks it had been possible for thirty years. Probably no other factor created more demand for offices than these acts, for they allowed the ready capitalisation of businesses independent of the personal assets of the principals.

One of the first effects of increased demand was the disappearance of residences from office buildings. A common practice in the City and throughout the country had been to provide a residence for a principal, a manager, or selected clerks above the public offices of banks and insurance companies. Stimulated in part by improvements in transportation which made suburban houses accessible, the residences were being replaced by the 1850's by offices to let. One of the first such buildings in the City was J. W. Penfold's 1857 Law Union Insurance Co. A residence remained, but it was for a
caretaker. This newer form of residence was definitely an inferior type. Penfold located it on the third floor. Other caretakers' residences soon to follow were in the attic or in the basement. Neither of these areas could be profitably let as offices because of light and access problems. Once the idea was demonstrated it was not long before it became a standard. I'Anson noted in 1864 that the only residents remaining in the City were caretakers.

The disappearance of the principal's residence allowed more space to be let for offices, and, more importantly, removed the restrictions that quality residential planning had on building design. The City buildings that were developed in the late 1850's and 1860's became models for offices built throughout the country for the remainder of the century. The primary accomplishment of these buildings was exceedingly straightforward: the maximisation of lettable space while still providing adequate natural lighting.

There were no limits other than 'Ancient Lights' on the height of buildings in London after the 1844 MBA, when an 'Extra First Rate' category allowed buildings of unlimited height. The 1855 MBA abolished even these requirements, eliminating all restrictions on height. 100

In practice, the height of office buildings was set by the willingness of businessmen to climb stairs. Rents were substantially reduced on upper floors. It was noted by one experienced City practitioner, J. J. Cole, that the third floor space was not generally profitable. 101 His observation was probably accurate, for most of the offices to let in the City were no more than four storeys high. 102 (See Appendix 2) Curiously, this limit apparently did not apply to banks and the insurance companies near the Bank, for there the most common height until about 1880 was five storeys. This pattern could
have several explanations. The top floor might have been profitable because of the demand for space near the Bank. Perhaps the prestige of association with a well-known bank or insurance company allowed the top floors to rent at a higher rate. This last point is supported by the status hierarchy in the City. Banks and insurance companies were most highly regarded, offices to let were second, and buildings with shops at the ground floor were least respected of all.\(^\text{103}\)

In planning as well as building height, banks were the special exception. Cockerell and Tite's London and Westminster Bank provided the model for banking halls throughout the country, but the purity of its conception and spatial arrangements generally remained unattainable. A high domed bank office blocked windows of upper floor offices; it additionally required a site with sufficient room for a banking hall to be placed behind a row of ground floor offices. Even banks could not afford such luxury on expensive sites. Bank designers instead had to follow the model in spirit if not in particulars, and developed a variety of organisations to suit functional needs and site circumstances.

![Diagram of London and Westminster Bank Section](image)

There were, however, several noteworthy banks with the purity of the London and Westminster. Peddie and Kinnear designed an extensive addition for The Royal Bank of Scotland in St. Andrew's Square, Edinburgh (2-30) in 1859, which featured a banking hall under a single
dome. The floor was larger than Cockerell's: sixty feet square, with thirteen feet deep alcoves at two sides. The dome, with approximately forty-five feet to the glazed oculus, was slightly lower. Its construction, following the example set by the British Museum, was framed with wrought iron ribs; unlike the Museum, they were not expressed internally. Another spectacular banking hall was built in Leeds in 1863, for the Beckett's Bank. Designed by G. G. Scott, this building has been considered by critic Stefan Muthesius to be 'modest in dimensions, little more than a townhouse.' The exterior was relatively unassuming. Perhaps Muthesius was unfamiliar with the interior, for it was quite the opposite. The banking hall soared through the two and a half storey height of the building. It culminated in a roof light resting on timbered trusses spanning to a colonnade of polished granite. It is not coincidental that both of these buildings were in the provinces, where others could be cited as well. In the City such spatial gestures were a luxury.

It is quite surprising, then, that the National Provincial Bank, with the most spectacular banking hall interior in the City, was created in response to contextual problems. The constraints from 'Ancient Lights' on this building have already been mentioned, but attention to Gibson's organisation reveals just how much he really accomplished. Whereas the examples just cited were noteworthy for their verticality and their regular spatial order,
the National Provincial Bank was noteworthy for its regularity despite all odds. The property lines created an irregular site within which to work. Gibson ran a bold axis through it. The most memorable features of the hall were its three glass domed rooflights. These reinforced the axis of the centreline, increased the vertical height, and, with peripheral columns, established the large scale of the room. Gibson avoided the temptation of locating the main entry on the axis. As in good bank planning, he brought it in at the side, thus creating a well-lit clerical space along the street wall. Gibson accommodated the slight irregularities of the site through bays that were imperceptibly non-rectilinear and a series of alcoves of varying depths along the east wall.

Few banks in the City or elsewhere could approach this accomplishment in size or grandness or scale. Even the London and Westminster departed from the Cockerell and Tite example when it rebuilt its banking hall in 1867. (2-32) It replaced the highly articulated, memorably shaped space with a lofty single storey, 'unusually well-lit but commonplace.' 105 Measuring eighty feet by sixty feet, it was second in size in the City to the National Provincial. 106 The previous structural separation between the hall and the office block was removed with the upper floors supported on four cast iron columns. 107 Undoubtedly, the lighting to the upper floors was enhanced by lowering the bank office roof.
The banking halls discussed so far were all top lit spaces, and as such represent one of the generic approaches to planning office buildings with large spaces. Insurance companies also occasionally employed the approach, as the Ocean Marine Insurance Co. in the City did in 1862. One of the more outrageous examples was by Thomas Turner for the Lancashire Insurance Co. in Manchester in 1866. Turner located the insurance hall at the back of the building, where it could rise through four floors to a rooflight. The access was in a manner more common in the provinces: past several shops and a ground floor office to let. In the office, Thomas accented the verticality of his space by eliminating all windows on the street facade. While unique, the spatial gestures may have been almost accidental. Turner's weakness as a designer showed in the facades, which had an almost catalogue-like assembly of components, completely lacking resolution.
Top lighting was one of the main approaches to natural lighting. The other, front lighting, was more common. The choice of one or the other was related to context and function. Site size and shape, the requirements for floors over the public office, and internal arrangements were all necessary considerations. Undoubtedly the quality of lighting varied. Several nineteenth century critics thought top lighting was harmful and uncomfortable, but by the twentieth century it was considered ideal for office use. Top lighting offered several advantages. Arrangement of desks and counters could be based on entry approach and spatial effects rather than on lighting alone. Larger offices required top lighting because it allowed for a contiguous mass of clerical desks, as in the National Provincial head office (2-34) or the London and Westminster. (2-32) Another advantage was in appearance at the street. A top lit office allowed a more solid and substantial appearing facade. T. Chatfield Clarke called the lighting requirements of a side lit office 'an inevitable sacrifice of the architecture for the light.' The stylistic importance of a solid wall will be discussed later, but the consequences of side lighting as measured in window area could be dramatic. Lucy and Littler's Alliance Bank, built on Castle Street in Liverpool in 1869, showed the stylistic ideal and the lighting need. (2-35) The building's several floors of offices above precluded top lighting. Streets on three sides, however, allowed the architects to place the banking hall at the rear of the site and still enjoy ample side lighting for the clerical spaces. Accessory bank offices were placed at the street. With this arrangement the architects achieved a highly effective centre entry terminating in the banking counter. The consequences this had in the window arrangement is evident by comparing facade treatments. The banking hall windows were quite large, destroy-
ing the sense of mass of their side street facades. The Castle Street front benefited from smaller windows lighting only the small peripheral offices.

On Bishopsgate in the City, similar contrasts were evident. Since John Gibson did not have to provide a large amount of light from the street windows on the National Provincial Bank, he was able to design a facade with solid Classical proportions. (2-36) Summerson called it 'by far the most exciting, and perhaps really the Queen of all the City banks since Soane.' A short way down the pavement, T. Chatfield Clarke's Royal Bank of Scotland was unable to benefit from top lighting. Clarke resorted to a facade treatment which was little more than a Venetian arcade with glass infill. (2-37) In an effort to accomplish with 'depth and boldness' what he could not with mass, Clarke projected his arcade through two storeys.

The City had many buildings in which lighting needs eroded walls into nothing more than decoratively treated ranges of piers. John Belcher's design for the Royal Insurance Company on Lombard Street in 1857 was essentially all piers, (2-38) as was the rebuilt Royal he designed with his son nine years later. (2-39) Others were P. C. Hardwick's Union Bank of London, C. O. Parnell's London and County Bank, and Benjamin Tabberer's No. 42 Cornhill. (2-40) This latter building was initially occupied as a bank. It showed, however, how similar bank lighting needs could be to those of the common shop. It was designed speculatively to house a bank, an insurance company, or a shop.

The front lit public office had another impact on facades. It presented the problem of locating separate entries for both the ground floor office and the smaller offices above, while still main-
taining adequate light. By far the most common approach was to locate the two entries at opposite ends of a range of openings.

![Bank Elevation Diagram](image)

This was done, for example, by the Francis brothers in the City for the National Discount Company in 1857, (2-41) by Henry Baker in his London and Westminster branch, (2-19) and in Edinburgh for the Bank of Scotland by Kinnear and Peddie. These are a mere sampling of the most common form. Other alternatives would have been to place both entries side by side, or to use a single entry with a vestibule allowing access to both the ground floor and the upper levels. The former alternative was rarely if ever used. The latter was employed in just one recorded building in the City, by W. W. Gwyther for the Commercial Banking Company of Sydney on a very narrow site on Birchin Lane.

The popularity of the more common approach was undoubtedly related to the separation of functions, the visual stability, and the symmetry it offered. So strong in fact was this combination that it remained the preferred treatment through the First World War.

Compositional difficulties could result when only a bank entry was needed. Two London examples from P. C. Hardwick's abundant but generally unnoticed œuvre make the point. For the Union Bank of London head office (2-42) in 1868, and Drummonds Bank, Charing Cross, a decade later, Hardwick employed symmetrical compositions, accentuated by giant orders of engaged columns or pilasters. The
main entries were casually placed in the end bays. Hardwick's compositions were awkward; they would have gained from an additional door.

The conflict in corner banks between the traditional angle entry and the ideal bank organisation has already been noted in F. W. Porter's Union Bank. Despite these problems, the corner entry remained a favourite choice. The Francis brothers' design for a bank in Cambridge, (2-43) and E. and W. H. Nash's Central Bank of London, Stamford Street branch,119 were representative of this approach. In small banks lighting was adequately provided by one wall of side lights. A design by Porter several years later, again for the Union Bank, produced a more negotiated response to the corner. For the Charing Cross branch he brought the entry in at the extreme end of the facade, leaving only a richly decorated window to mark the traditional entry location. (2-44)

As has been noted, insurance companies did not share the banks' requirements for contiguous clerical spaces. This freedom was reflected in their front facades. Some on small sites, such as John Shaw's London and Provincial Law Life on Fleet Street, 1855, employed a side entry, (2-45) apparently to save space. When there was sufficient room, a centre entry seems to have been overwhelmingly preferred. For example, William Grellier's Royal Insurance in

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**INSURANCE OFFICE ELEVATION**
Liverpool, and Piper and Goodchild's North British and Mercantile Insurance Offices (2-46) in the City both employed a centre entry on very broad facades. Ewan Christian's Economic Life Assurance Company did the same but, unfortunately, on a street exposure that wasn't quite large enough to contain his expression. (2-47)

The approaches outlined here represent the most important planning requirements of large offices. Their consistency throughout the Victorian period attested to both the steadiness of business operations and the overwhelming dependence on natural lighting.

As in buildings with large offices, adequate natural lighting was the most important consideration in the overall organisation of buildings with small spaces. Whilst the main problems in large offices were based on the relationship between lighting and functional needs, in small office planning they were based on the relationship between adequate lighting and the need to maximise building size. Nowhere was this more important than in the City, but the similarity of office building planning between the City and the provinces suggests that the techniques developed in the City were freely borrowed throughout the country.

In addition to being extremely expensive, building sites in the City were often unusually deep or had a small amount of perimeter exposed to a street. This situation was generally not so extreme in provincial cities. In the City, for example, there was over 400 feet between Bishopsgate and Broad Street and more than 330 feet between Mincing Lane and Rood Lane. In contrast, a common block width in Glasgow was about 120 feet from a street to a lane, whilst in Liverpool a block rarely exceeded 140 feet, and in Manchester widths of less than 170 feet were common.

Several relatively inflexible limits controlled the design of
mid-Victorian office buildings with small spaces. As has been noted, buildings could not practically exceed four, or perhaps five, storeys in height, and office spaces couldn't exceed fifteen to twenty feet in depth, measured from the window to the inner wall. On a site of 300 feet depth with relatively little street frontage, the only way to provide lighting was through light areas carved out of the volume that otherwise would have been built as office space.

Architects only grudgingly allowed space for these areas. I'Anson noted 'one of the most important points is to consider what is the minimum amount of space...necessary to sacrifice for obtaining light and air to the various rooms.' More space for areas meant less space for offices, and less return for the owner. But this relationship held only to a degree. A well-lit space could command higher rents than one poorly lit. In the absence of scientific measurement or prediction techniques, a considerable amount of building success was dependent upon the architects' lighting experience and judgment. A considerable difference of opinion on how to best satisfy these requirements was said to exist among office designers in the City. Unfortunately none of the subtleties of the issue have been recorded. All that we can hope for now is an understanding of the general practices clarified by examples.

The ubiquitous white tile area linings were one of the most memorable features of Victorian offices. I'Anson claimed to have been first to use them, on the Royal Exchange Buildings. By the time of his 1864 RIBA presentation they had become as common in areas as plate glass was on street facades.

His unusual concern for lighting was again evident in his areas, which he felt should be no less than ten or twelve feet wide. Other architects of the time created areas as narrow as seven feet wide.
A survey of Goad's suggests that a ten foot dimension was more common. The amount of volume given up for lighting was substantial with ten foot wide areas and fifteen foot deep offices spaces, more than twenty-five percent of the potential buildable volume was given up for lighting.

With such narrow widths and heights of several storeys, the areas could not have brought anything more than reflected light to most of the offices they served. However soft reflected light must have been ideal for office tasks. Additionally, I'Anson believed that at certain times of the day, the lighting level available in an area was greater than that available in a neighbouring street.  

BUILDING WITH SMALL OFFICES

The requirement for lighting areas and narrow office spaces produced a building section which, with minor variation due to use, site size, and architectural judgment, became perhaps the most repeated aspect of office building planning. Norman Shaw's New Zealand Chambers was representative. Saint claims Shaw 'adopted and furthered the ideas of Edward I'Anson, the greatest contemporary expert on office planning.'  

Such praise exaggerates the accomplishments of both men while indicating the scarcity of modern knowledge about office planning. Shaw's building was hardly innovative, but its section indicated that Shaw understood and employed methods that were common in the City.
In 1857 I'Anson ran his light areas through the entire height of his Colonial Chambers, with a ground floor space open at the bottom. Potential use for this space in offices is difficult to perceive. It may have been the result of a clause in the 1855 MBA which called for a yard space of 100 square feet in dwelling houses; at this time the MBA did not clearly distinguish offices from houses. It wasn't until 1858 that such a space was allowed to begin at the first floor line when the ground floor use was not a residence. 127 I'Anson's primary innovation in section seems to have been the rather curious one of splaying the lower part of his ground floor window outwards, in order to increase reflected light to the offices above.

The difference between I'Anson's section and Shaw's was the latter's complete filling in of the ground floor with lettable space, lit entirely by rooflights. (2-48) The lighting levels of such space could be greater than anywhere else in the building due to the direct exposure to the sky surface. These spaces were valued for tasks that required even more light than offices - generally sample rooms. So common was the practice of building across the bottom of areas that entire blocks of City property had virtually no exposed land area at all. The block stretching westward from Mincing Lane to Rood Lane was one such case. Here the Colonial trade had a strong demand for sample rooms.
Another advantage of enclosing space at the bottom of areas was that it allowed the ground floor offices to encompass a much larger space than would otherwise be possible. One example, by the Francis brothers, was the design for the City Offices Company building at 37-39 Lombard Street. (2-49) Initially utilised as a newsroom, it was later converted to a banking hall for the Credit Lyonnais. 128

Two other aspects of Shaw's section for New Zealand Chambers indicate common practice. In buildings comprised entirely of small offices to let, with no shops or public offices, the ground floor was customarily lowered by one half level. This had the effect of maximising the rental income by minimising the number of stairs required to reach the upper floors, and by allowing rental of what would otherwise have been basement spaces. This practice was evident in the City in warehouses as early as the 1850's, where it was said that such half-level basements rented for almost as much as ground floor space. 129 Quite likely the same was true of offices. The rental figures quoted for Shaw's exceptionally well-lit rear basement space, for example, were equivalent to ground floor rentals of the period. 130

The last representative aspect of New Zealand Chambers was its greater height at the street, made possible by an additional floor as well as higher floor heights. As indicated by Goad's Maps, architects commonly added an extra floor at the street front. Both I'Anson and John Whichcord employed higher floors at the street. 131 The tolerance for additional height may have been due to the greater availability of lighting in the streets, which, no matter how narrow, were always wider than light areas. Despite the restrictions of 'Ancient Lights,' buildings rose to what Hitchcock calls the 'new financial height,' making imposing impressions on the street.

In the City land values were so high and the range of commercial
endeavors so great that in many cases every available cubic foot of space that could be built was leased, although for uses other than offices. Sample rooms located in the basement spaces have been noted. The other common location for sample rooms was on the top floor, with abundant lighting provided by rooflights. This was done, for example, by John Whichcord at 9 Mincing Lane. Other common uses included stores, wine vaults, and strong rooms. If not covering entire floors, these were relegated to the darkest part of floors. The City Offices Company building on Lombard Street was not unusual in having two full floors of vaults.

Probably the greatest subterranean storage scheme was designed for the National Safe Deposit Company on Queen Victoria Street by John Whichcord in 1874. Beneath the office block, extending down forty-five feet, were fireproof vaults for money deposits and document storage. Protected from burglary by guards, the vaults were encircled by corridors to ensure protection from would be thieves tunnelling from neighbouring properties. A series of reflectors transmitted light to the depths of the vaults, free from fire hazard and gas burner vitiation. These extensive measures were in fact extensions of the practice commonly employed by banks. Vaults were most secure when built at the centre of basements with corridors or other spaces surrounding them, as was done by T. C. Clarke in the Royal Bank of Scotland, Bishopsgate.

Whilst there were very few building section options, plans were developed in several variations. As with much of office design, they responded to a number of constraints. Buildings were invariably designed as series of rooms and with few exceptions each room opened directly to the corridor.

City architects employed three generic approaches to overall
building organisation. Probably the most common method\textsuperscript{136} was that of linked 'stacks.'\textsuperscript{137} Shaw used this approach for New Zealand Chambers, as did I'Anson for Colonial Chambers. (2-26) The 'stacks' of offices were connected at each floor with corridors, rather like pearls on a string. Stairs could be located either within the stack, as in Shaw's building, or within the area, as in I'Anson's. The advantages of linked 'stacks' were that natural lighting was admitted to the corridor at regular intervals, and circulation could be highly efficient, since a single stair could serve several stacks. A major problem, however, was that the number of offices that could be combined to form a suite was limited unless the offices had no corridor access. Colonial Chambers, for example, could readily offer suites of two rooms, but none of more than three.

Another common approach was taken by John Whichcord at 9 Mincing Lane. (2-51) Here the 'stacks' were extended along double loaded corridors, and connected only at the ground floor. Whichcord served each 'stack' with its own separate stairway. Other architects extended their corridors with branches to serve whole building sites. The double loaded corridor, now so common as to be banal, was almost unique to offices in the mid-nineteenth century. Only hotels used it as consistently as offices.
The advantage of separating 'stacks' was that noisy corridor traffic was limited to the ground floor and valuable lighting in the areas was not blocked by the interruption of corridors or stairs. Double loaded corridors allowed a greater number of offices to be combined into a single suite than with the linked 'stacks.' Unfortunately, the suite arrangements were linear.

This approach, at least as executed by Whichcord, could not have offered the quality of corridor lighting that linked 'stacks' did. Whichcord placed rooflights over his stairways, but the double loaded corridors must have been rather dark. Problems with this type of corridor must have been common, for they brought complaints from at least one correspondent in The Builder. One solution was to employ office doors with frosted glass located across from external windows, as was done in the Royal Courts of Justice Chambers.

The last major planning approach was one in which the corridors and offices were arranged around an open well hole. This organisation
was similar to that of Manchester warehouses in the City. The display of cotton goods required so much light that the warehouses commonly had roof lit well holes penetrating several floors. The open wells posed problems of fire safety, for they increased the spread of fire through floors. I'Anson made use of this concept in Bell Court, and with glass partitions along the corridors, in the offices of the British and Foreign Bible Society. Gibson employed it for the office block at the rear of the National Provincial Bank. He filled the well with a generously proportioned stair more fitting to a country manor than a City office.

The choice to use these different planning options was related primarily to site size and restrictions. The open well hole was employed on the smallest or most restricted sites. The National Provincial site, as has been noted, was severely limited by 'Ancient Lights.' I'Anson's Bell Court was actually built on a property with no street front, behind several other buildings. The double loaded corridor approach was more common on the larger sites, where its advantages in allowing contiguous suites of rooms would have been most obvious. Linked 'stacks' were employed for the medium sized buildings of up to 10,000 square foot ground area.

In planning their buildings, architects paid little attention to solar orientation. The concept of the uniform solar hemisphere as advocated by Hesketh and Kerr must have been a common understanding. The orientation of areas, as indicated by Goad's Maps, was related to site shape. Each planning option allowed approximately the same floor area ratio. With about 3.6 times the ground area in floors, building efficiency was quite good, comparing favourably with the average ratio of 3.9 in the City of London even as late as World War Two. (See Appendix 3)
Whilst making their buildings as large as possible to meet business needs, architects also made them as flexible as possible. Early Victorian office buildings were generally designed with internal masonry bearing walls. The approach remained throughout the century in buildings such as Palace Chambers, (2-54) built in 1878, and Moorgate Court, (2-55) built as late as 1895. But it was appropriate only for offices in which the tenants were expected to be small companies, requiring only one or two rooms. Other offices to let needed sufficient internal flexibility to allow for different room and suite sizes. By the mid 1850's two innovative approaches to flexibility were in use. One involved planning, the other structure.

The planning approach simply utilised double loaded corridor walls as bearing walls, thus allowing office spaces to be built as narrow but continuous spaces. Non-bearing partitions were then utilised to subdivide the offices as needed. When a tenant moved, the partition locations could be changed. Wimble and Cuthbert utilised this approach in their Royal Courts of Justice Chambers. John Whichcord used it in his City buildings, including the offices in Water Lane, 1858, Mansion House Chambers, (2-56) and 9 Mincing Lane. (2-57) In the latter two buildings Whichcord changed the top floors to increase flexibility. At Mincing Lane he omitted the corridor, allowing substantially larger rooms than could be provided on other floors. With their rooflights they must have offered unusually large, well-lit spaces, especially suited for sample rooms or large clerical staffs. At Mansion House Chambers Whichcord supported his roof on iron columns, thus minimising the interruptions to spatial planning posed by the bearing walls below.

Iron columns were often used for all floors of office buildings. Since iron construction was still in its infancy it was a more un-
certain approach to internal flexibility. But it offered greater potential in arrangements since there were no bearing wall interruptions. Greater lighting levels were possible if partitions were made in glass, as was common. I'Anson employed iron columns and plate glass partitions in his Colonial Chambers (2-26) in 1857. This building, with its provocative front, (2-25) was a virtual glass box, the 'Crystal Palace' of office design. I'Anson's lead was followed by many others. By 1871 when the Belchers employed iron columns for the internal support of Mansion House Buildings, the technique was becoming common.

The repeated demand for structural and planning openness indicates the sophistication of City offices. The date of Mansion House Buildings was nearly the same as that of the Chicago fire, but it took nearly two more decades for the Chicago office tenants to expect office space supported on internal iron columns.

Major Accomplishments

As leases fell in or freeholds became available for purchase, City developers were quick to rebuild larger offices. Even sites almost too small for offices, such as the tiny 1000 sf property of the Colonial Life Assurance Office on Lombard Street, were open to development. In general, however, most office building sites were considerably larger than this. I'Anson's Colonial Chambers on a 6600 sf site, and Shaw's New Zealand Chambers, with an 8250 sf site, were typical of the general range of offices. Even sites of this size, however, were invariably assembled from several smaller parcels.

There were several exceptionally large office buildings. They were significant not just from the amount of investment they represent-
ed, but because they extended office building planning to an extreme. Unfortunately, information about these buildings is limited. Those owned by the City Offices Company are illuminating exceptions, for company records reveal a wealth of information about the intimate connections between property size, exaggerated income expectations, and financial success. Whilst it is difficult to project the success of this company as representative, its difficulties in letting space and in paying dividends does suggest that the enthusiasm for such large ventures expressed by the contemporary critics such as I'Anson, and repeated by modern critics such as Summerson, needs to be reviewed with caution.

Extensive street frontages and regularly shaped sites were limited commodities in the City. The offices known as the Great Winchester Street Buildings had both of these ideal characteristics, as well as one of the largest sites of the mid-Victorian period. The 36,000 sf site encompassed a full block, with a primary front on London Wall, just west of Old Broad Street. The Buildings, probably built before 1867 to the designs of a now forgotten architect, show just how severe and regular the office accommodation could be when the contextual circumstances allowed it. The plan (2-58) was based on the double loaded corridor principle with eighteen feet deep offices and ten feet wide areas. Although a contiguous block, the Buildings had four completely separate circulation systems, each with an entry on London Wall and another on Great Winchester Street. Sets of stairs at the third points, in well holes, and rooflights at the top floor provided the only spatial and lighting relief for the 180 feet long corridors.

The largest of all the office buildings built in the City in this period was Gresham House. (2-59) Its 48,000 sf site stretched
between Bishopsgate and Old Broad Street. Its architect is now unknown; its date of construction was prior to 1863. The building was organised along double loaded corridors placed perpendicular to a wide corridor that connected the street fronts. Corridor lighting was accomplished by rooflights over the stairs, and by a rather unique system of well holes at the termination of the corridors in each side 'stack.' The areas were up to eighteen feet wide. Curiously, despite this generous width of the areas the lighting was criticised as insufficient.

Gresham House had been built as a private speculative venture. In the years immediately following the Joint Stock Acts, a number of limited liability companies were formed to build and let offices. Probably the first of these was the City of London Real Property Company, started by the Innes Brothers in 1864 with a progressively designed building on Mark Lane by George Aitchison. Other property companies included the Registered Land Company and the City Offices Company. The Registered had at least one building in the Colonial district, where small offices, sample rooms, and moderate rents were the common features. The City of London Real Property Company started there as well, although by the end of the century it had buildings all around the City.

The most boisterous of the development companies, and the only one to concentrate its efforts in the high priced area around the Bank, was the City Offices Company. Started in 1864 with a million pounds in capital, the company immediately set out to purchase land and buildings valued at over £365,000. Acquired at what the company directors considered reasonable prices, the properties were expected to return 15% to 20% on their capital outlay, or, if sold, would 'leave the City Offices Company, Ltd., a very large profit on
the cost. Properties near the Bank included 25-27 Clements Lane, 'the largest block so near Lombard Street that has been on the market for years,' 17/18 Cornhill, and 'the largest block in the City,' which was soon to become Palmerston Buildings. Within two years the company acquired a site on the corner of Lombard and Gracechurch even larger than their Clements Lane property around the corner.

Of these the grandest venture was the Palmerston Buildings. Located on a freehold and three leaseholds, one of which had been the Old Bull Inn, the building extended from Bishopsgate to Old Broad, a distance of more than 340 feet. The total site, 30,000 square feet, was impressive in size, although still smaller than that of its immediate neighbour Gresham House.

The intentions of the company in this venture were clear. The directors proclaimed: 'in both streets there will be imposing frontages. The new building on this magnificent site will contain upwards of 260 offices, with the most modern conveniences and improvements.' F. & H. Francis were the architects, as they were for all the company's buildings. They worked for an annual fee, and were given offices in the building. As construction neared completion the building was considered 'thoroughly well adapted to its purpose; the corridors are broad and handsome, the rooms spacious and lofty, and the supply of light ample.' The Building News noted that 'the task presented to the architect was to obtain the largest amount of available space for offices, consistently with a due amount of light and ventilation. This has been accomplished by large and spacious open courts.' Specifically, these areas were twelve to twenty feet wide. In a rare reference to orientation, their east to west orientation was claimed as contributing to the quality of light,
as was the tactic of aligning the areas with those of neighbouring Gresham House. This latter effort was uncommon if not unusual, as many office blocks were built entirely within enclosing fire walls. 163

In addition to four floors of offices, the building had two basements for strong rooms, vault storage, and wine cellars. All of this amounted to a phenomenal expenditure of £80,000. 164

Despite the initial enthusiasm of the promoters for both the company's profitability and the success of Palmerston Buildings, neither quite met expectations. For the first twenty years the semiannual dividend of no more than 6/- per share was a constant disappointment to the directors and shareholders. Most of the company's other buildings let very well, but Palmerston House regularly had about £2000 worth of space unlet, most of it on the upper levels. It was almost twenty-five years before the building was fully occupied. 165 Much of the problem might be related to the difficulties of letting third floor space, but Palmerston Buildings even had a primitive lift from 1873. 166 One contemporary critic felt that office blocks such as this were so large that it was difficult for people to keep from getting lost in them. 167 Perhaps the Palmerston Buildings were just too grand an undertaking for their time. They extended to a point beyond common experience the highly efficient mid-Victorian office building formula.

'Architecture' in Plan

The Victorians equated architecture with decoration, symmetry, and repose. The giant offices such as Palmerston Buildings or Gresham House had no 'architecture' behind their facades. In fact, few Victorian offices did.

Nineteenth century concepts of architecture generally excluded
buildings which had no aesthetic intentions. To the nineteenth century mind, the internal aspects of office buildings might have been 'building' but they certainly were not 'architecture.' In general this attitude was justified, for the buildings displayed little internal stylistic interest. Public offices were the conspicuous exceptions: Gibson's National Provincial Bank and Lucy and Littler's Alliance Bank have already been cited from among the many 'architectural' public offices.

In buildings with only small offices, characteristics of 'mere building' were heightened. The most an architect might hope to achieve was a small bit of 'architecture' in a portion of his building. I'Anson's Colonial Chambers was a case in point. The desire for a symmetrical facade and an equitable balance of office spaces on an irregular site resulted in a corridor system with a rather curious semicircular connection in the front area under the stair. Beyond this the only other interesting 'architectural' element was the termination of the corridors at the second stair. Shaw achieved about as much 'architecture' in his New Zealand Chambers. An elaborate, broad symmetrical stair terminated in a glass enclosed vestibule at the centre of the Shaw-Seville Shipping Offices, the building owner. The remainder of the circulation was irregular, highly conditioned by surrounding areas and stacks of offices.

These approaches were typical. Beyond these the primary other 'architectural' quality was in the placement of rooms with important functions at significant locations. Shaw-Seville had their offices at the street side on the first floor. Banks and insurance companies, with a hierarchy of rooms, favoured a street side centre location for board rooms.

Efforts such as these were the height of internal 'architectural'
achievement in Victoria's reign. It wasn't until after the turn of the century, through the work of a few highly influential architects, that 'architecture' became an integral component of internal planning in office buildings.

Liverpool and Manchester Offices

The analysis so far has concentrated almost solely on the City. Office building patterns developed there mainly due to its intensive commercial pressures, high land values, and legal problems of 'Ancient Lights.' Provincial offices were rarely noted in the contemporary periodicals during the mid-Victorian years. There is generally no evidence to suggest that provincial offices were designed along anything other than the City of London model. The buildings might be lower, or on smaller lots, or have fewer areas, but the general City pattern prevailed. In Liverpool and Manchester, however, several unique developments occurred. They seem related to the cities' unique positions as centres of manufacturing and shipping of mill goods.

Office building activity in Liverpool was almost contemporary with the first efforts in London. Liverpool's first office building was the India Buildings built in 1834 on Water Street for George Holt. The architect is now forgotten. The building was built with floors the strength of a warehouse as a precaution in case it failed commercially as an office building. The offices were on four floors above shop fronts located a half level below the pavement. (2-61) The conservatism expressed by the building's convertibility proved unnecessary, for it was successful as offices. Others followed. By 1861 such 'commercial chambers' were said to form 'the special architectural feature' of the city.
In London only the largest of the office blocks were referred to as 'buildings' but the term was common in Liverpool. It was perhaps more accurate than in London, for in a planning pattern peculiar to Liverpool, contiguous yet separate buildings with separate entries fronting on the street or on a courtyard were built as single ventures. The India Buildings were of this type. So were Brown's, Brown's, the Temple, the Tower and the York, all designed by J. A. Picton, as well as the Queens Insurance Buildings in front of Samuel Rowland's earlier building for the Royal Bank off Dale Street. The York displayed the principle in the extreme, for the courtyard demanded so much space on the narrow lot that one of the buildings was only fifteen feet deep! The rationale for the planning is unclear. The courtyards between buildings were often connected. They provided excellent places for Liverpool's numerous small merchants and brokers to meet and conduct business, as was done on the Flags and in the Albany Building's courtyard.

Offices in Liverpool had the same needs for good lighting as those in London. The advantage of its wider streets was offset by the lesser light of the more northern latitude. Liverpool architects took a more liberal attitude toward functional lighting needs. Their buildings were stylistically less correct than their London counterparts due to window proportions, but more interesting for the subtleties involved in achieving adequate lighting. J. K. Colling's Albany
Building, (2-63) designed in 1857, featured extremely wide windows with cast iron intermediate mullions on its Old Hall Street facade, but still managed to maintain sufficient visual massiveness through the use of a splayed base, rustication, and a generously proportioned string course. Picton's The Temple, 1865, had large windows on the Italian stone-faced Dale Street front (2-64) but giant, horizontal windows spanned by cast iron lintels at the courtyard. (2-65) On his Hargreaves Building Picton was more subtle. The Chapel Street front (2-66) had windows set well back in round headed, splayed openings, but after one bay on the narrow Covent Garden side, the windows were pulled flush to the outside wall, and enlarged to completely fill the archivolt.

Next door, Mersey Chambers presented a more exaggerated response. A commonplace French-Italian front faced Old Churchyard, (2-67) but the Covent Garden side (2-68) had giant oriel windows in shallow arched openings on a white glazed brick wall. The articulation of each floor offered greater light penetration than multi-storey oriel windows would have allowed. Adjacent to Mersey Chambers on Covent Garden at the corner of Water Street was Peter Ellis's Oriel Chambers. Here the oriel's were similar in section to those of Mersey Chambers, but narrower. (2-69) Oriel Chambers was criticised at the time of its construction 1865. The Builder called it an 'abortion,' a 'large agglomeration of protruding plate-glass bubbles.' Ellis's error
was in taking a fenestration pattern accepted for narrow streets and applying it to the generous Water Street front. Conventional wisdom, as expressed by the glass size of other buildings on wide streets, suggested Oriel Chambers had too much light and probably was hard to heat. Victorian stylistic wisdom demanded greater sensitivity to balance, proportion and visual termination than Ellis provided.

Horizontal windows and oriels were a response to narrow streets and courts. They also served an office organisation that was almost unique to Liverpool and to a lesser extent, Manchester: the office block combined with sample rooms or warehouses. In the City, office buildings with sample rooms were common in the Colonial District, but there, as has been mentioned, whole floors were devoted to either offices or sample rooms. In Liverpool and Manchester, office spaces were built contiguous with these other rooms, in a manner that suggested a closer functional relationship than in London. Thomas Armstrong's novel, King Cotton, set in the Albany Building, vividly details how the sample rooms, immediately off the clerk's office, allowed clients to check the quality of cotton samples by pulling at them in the abundant window light. 176

In the Albany it is difficult to perceive a window pattern responsive to these different uses; the changing window size was related to the different street and court widths. The Manchester Buildings, built on Tithebarn Street by Haigh and Co. in 1856, was a vividly graphic example of the office-sample room pattern. Haigh and Co. was a builder that was said to 'keep an architect.' 177 The building was built as two separate blocks: one rounded the corner and the other, consisting of three 'stacks,' extended from Tithebarn to George Street. (2-70) Each 'stack' had an office

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and a sales room on each floor, separated by a bearing wall containing the fireplaces. The ground floor was continuous under the areas. Below it, as in so many other Liverpool offices, was a floor of storage vaults. (2-71) The most interesting aspect of the building was the way in which all of the office spaces were enclosed with masonry bearing walls and lit by separate windows, whilst all of the sample rooms had ranges of small cast iron columns, forming virtual curtain walls! The George Street front expressed this most clearly, (2-72) and showed another departure from City practice. Sales room lighting quality was so critical that the architect consistently oriented the windows to the north. The result was a facade of iron, completely lacking in repose. A City of London architect would have hidden the sample room window walls in the areas, and shown only a stone wall at the street. Few buildings in Liverpool exhibited the dual uses so vividly as the Manchester Buildings, although the City Buildings, just up Old Hall Street, exposed a portion of its mostly glass facade.

Similar patterns can be found in Manchester. Whilst most of the office buildings in the city up to this time were solely for offices, Clegg and Knowles designed a combination office block and warehouse on Brown Street in 1869. Its fenestration didn’t reflect the differing uses, but a building at 11 Peter Street did just as vividly as the Manchester Buildings did. The front was rather commonplace, but the side and rear, where the warehouse was located, had a range of oriel windows every bit as large and pronounced as those on Mersey Chambers in Liverpool. (2-73) Manchester undoubtedly had other buildings of this type, but contemporaries overlooked them. The destruction during and since World War II makes their accurate representation difficult.
A building worth noting, although built much later, was the Prince's Buildings on Oxford Street by Ire Birkett. This building formed a part of an extensive warehouse-office complex in at least four buildings, including an interconnecting tunnel under Cheapstow Street. Birkett's design located offices along the Oxford Street front and warehouse space facing the areas behind. The main front was stylistically dated when constructed in 1904, displaying what critic C. H. Reilly noted as 'chimneys... linked together... in the manner of some suburban fences.' The area facade, however, was remarkable: virtually all glass, its industrial sash violently contrasted the wedding cake front.

Whilst the differences in window sizes in Liverpool can be explained as a response to extreme functional needs and street widths, a peculiar office building pattern cannot be readily accounted for. Liverpool seems unique among British cities for the number of office buildings featuring glass enclosed courtyards. The City had no such buildings. I'Anson commented that he had never covered the tops of areas with skylights. Manchester had a few enclosed courts, as did Glasgow, but these were usually above an arcade or a works.

In Liverpool, however, well over a dozen office buildings featured enclosed courtyards.

The Brunswick Building by A. and G. Williams in 1842 was perhaps the earliest of these. Much of the Brunswick's stylistic inspiration came from the Palazzo Farnesse; its interior court was similar to the Italian cortile, but with a glass roof. The Liverpool and London Insurance Co., designed by C. R. Cockerell in 1857, was the most prominent of the covered court buildings. This, like so many other Liverpool offices, was actually several contiguous buildings.
Dale Street front, with the remainder of the building used for subsidiary offices and for letting. The area originally ran through four storeys to the basement. (2-77) Cockerell's other office design in Liverpool, the Bank of England Chambers, 1855, contained a similar but smaller covered area, with a stone stair at either end. A partial enclosure, with glass protection at the roof but open at the sides, was employed at 14 Castle Street (2-78) by Grayson and Ould. More completely enclosed examples are still to be found inside Mersey Chambers (although subdivided by a wall) and in Imperial Chambers on Dale Street. Both of these buildings employed oriel windows for the walls facing the courts, suggesting a close relationship between these enclosed, public circulation spaces and the numerous small alleys and streets that wander through the centre of Liverpool.

The Liverpool buildings and their Manchester brethren were anomalies in the evolution of Victorian offices. The standard office had no need for sample rooms and little space for courtyards. The more common offices employed linked 'stacks' or double loaded corridors, with ground floors completely filled as offices.

The quarter century between the passing of the Joint Stock Acts and the general acceptance of the lift in the 1880's saw the emergence of the major contextual and functional forces that were to shape office building form well into the twentieth century. The opposing pressures of 'Ancient Lights' and rising land values jointly shaped office form. Lighting needs in both large and small offices established room proportions and placement. Building planning was highly rational. Developments to come changed the outward appearance of offices, but the differences were generally extensions or intensifications of the patterns established between 1855 and 1880.
lit and top lit banks and insurance offices, office planning with 'stacks' and double loaded corridors remained firmly in place.

The mid-Victorian years were the most important period in the development of British office building form. Unlike the legacy carried over from the early Victorian offices, the office building patterns developed in the middle years remained the substance of developments up to the First World War.

LATE VICTORIAN FORM, 1880-1900: GROWING PAINS

In the closing Victorian years office buildings continued to be responsive to the functional and contextural forces that had emerged at mid-century. In addition, the introduction and slow acceptance of the lift allowed an increase in building height. When buildings rose, they taxed the fire brigade and challenged health theory and the 'Laws of Ancient Lights.'

Building Height

The demand for office space in the City brought about a steady escalation of the price of land. (See Appendix 1) The value of properties near the Bank rose five to ten times in the last half of the century.¹⁸⁹ No. 59 Cornhill for example netted £40 per foot in 1878.¹⁹⁰ South Sea House was sold in 1899 for £45 10s 2d per square foot of land area, or nearly £2 million per acre.¹⁹¹ Values such as these were not unusual. Land near the Bank had been expensive since the beginning of the Victorian period, but now high prices were seen even in the less expensive areas. Even on Carter Lane, near St. Paul's, land was sold for £433,000 per acre in 1886.¹⁹² One on Cheapside was sold for £36 10s per foot in 1903.¹⁹³ With values rising as high as these, the lift became necessary to maximise building sizes.
Goods lifts had been employed in Midlands mills since the 1830's, and book and bullion lifts had commonly connected banking halls with basement vaults since the 1840's, but the first passenger lift was not installed in Britain until 1860. The practical use of lifts for passengers had been delayed until the invention of the safety brake, patented in 1857.

Hotels were the first to employ passenger lifts. The motive power in mills and banks had generally been manual, but the early passenger lifts commonly employed steam power to turn a winding drum. The frequency of passenger and goods traffic in hotels would certainly have made lifts attractive, but it was the presence of steam boilers on the premises for heating or cooking that made powered lifts simple additions to existing building services.

Office buildings generally did not have central heating. A steam operated lift therefore entailed an extravagant expense. The alternative, a water powered hydraulic lift, demanded mains pressure greater than that available in London, and again required steam power for an accumulator as well as rooftop tanks to develop the necessary pressure.

Such extra effort and expense might have been justified had the public felt at ease with lifts. Unlike New York, where elevators stimulated the additions of several storeys on top of existing buildings, and where the higher floors commanded higher rents, lifts were treated with caution and suspicion for forty years. Deaths due to carelessness or failures were common. The Builder reported three deaths in the City in 1866. Even as late as 1916 and 1917 there were still fourteen and ten deaths per year, respectively. One installation in an office building in 1874 was cautiously noted by The Builder to be for 'those who choose to avail themselves of it.'
Even advocates of tall blocks of flats, such as T. Roger Smith, had to acknowledge 'of course, a steam or hydraulic lift implies a certain amount of risk,' but he continued, 'so do railways, but yet people seldom hesitate to travel upon them.'

Lifts came into general use by the turn of the century, but they were still not really accepted without hesitation. This lack of faith in the devices was best expressed in office building rental schedules. Rental value of upper office floors was understandably low prior to the introduction of the lift, but surprisingly, it changed very little after. Even hotels continued to build cheaper and less well finished rooms on upper floors until at least the First World War. Horace Cubitt noted as late as 1911 that third floor space rented for one third to one fifth the amount of ground floor space, and only one half that of the first floor. These ratios were approximately the same as those in the mid 1860's. One noteworthy anomaly in rental schedules was the Queen Anne Mansions, where Hankey charged as much for the top floors as lower ones. The Builder was shocked to report that the upper floors of Queen Anne Mansions not only rented, but were preferred.

Although they never captured the public imagination, lifts were considered necessary by tenants not long after their introduction in offices. The first lift to be noted was installed in J. F. Ward's Albert Buildings on Queen Victoria Street in 1872. He followed it with another directly across the street, in the Imperial Buildings in 1874. The Imperial had several floors of vaults below the pavement which may have stimulated the lift installation.

The City Offices Company experience was perhaps representative of others. As has been noted, the Palmerston Buildings had never rented very well. The directors of the company decided to install a
lift in 1873. Within two years they reported 'the satisfactory working of the lift in Palmerston Buildings...had been the means of letting many suites of offices on the upper floors.' £2000 per year in additional income was attributed to the lift, but in 1876 £3390 worth of space still remained unlet in the building. The company was extremely cautious about its lift. The board regularly reported the operating costs as a separate line item, but it did not do the same for other equally important expenses, such as cleaning. Accident insurance was considered a necessary precaution.

The company did not install another lift until 1882, in the 39 Lombard Street property, and then only when a tenant paying £4000 per year threatened to vacate. The lift was reported to give 'great satisfaction to the tenants and others using the upper three floors. (It) will...keep the upper floors occupied and will increase their letting value.' By 1885 the lift in Palmerston Buildings was considered outdated. 'That lift had proven very useful, but it was very heavy and clumsy in construction, expensive in its working, and not adapted to present day requirements.' A second lift in the Palmerston Buildings was not considered to be necessary, however, until 1899, when it was installed at the request of tenants. It was located at the opposite end of the very long building.

Lift installations in the company's properties cost between £750 and £1000 each and annual expenses sometimes amounted to over £280. The expense no doubt contributed to the directors' caution, but this was outweighed by the lift's success in attracting and securing tenants.

The Palmerston Buildings' lift installation in 1873 was one of the first in the City, but by the time it was replaced in 1885, lifts
were quite common.\textsuperscript{218} The installation of hydraulic lifts was greatly facilitated by the distribution of high pressure water by the London Hydraulic Power Company, chartered in 1884.\textsuperscript{219} By 1887 most of the streets in the City were served with power, and over 600 customers were tied to the company lines. With a connection, the costs and maintenance of a steam engine were avoided. All that was necessary for the operation of a lift was an operator for about £65 per year,\textsuperscript{220} and the water supply, which ranged from £47 to £127 per year.\textsuperscript{221}

The operating cost was a concern for many building owners, and the relative merits of buying pressure versus making it on the building premises was a major issue.\textsuperscript{222} A more efficient competitor emerged in the 1880's with the introduction of the electric lift, featuring a car suspended on cables like the steam powered lift. Initially it required a steam engine to generate electricity. With the general availability of electricity in the 1890's, it came to be favoured due to lower operating costs\textsuperscript{223} and increased efficiency in taller buildings.\textsuperscript{224} By 1906, electric lifts were said to outnumber hydraulic lifts by a three to one margin.\textsuperscript{225}

With the lift, the general height of office buildings increased, but only slightly. (See Appendix 2) The initial response in the City was seen in the Commercial Buildings on Bucklesbury, designed by John Whichcord in 1880.\textsuperscript{226} The building reached six storeys above the pavement. Wimble and Cuthbert's Royal Courts of Justice Chambers rose to the same height,\textsuperscript{227} as did Delissa Joseph's St. George's House in 1888.\textsuperscript{228} These were the tallest offices to let in the City built during the Victorian years. Like the four storey office of the mid-Victorian years, six storeys became the new standard of the day. Only one building in the City topped this height: the Commercial Union...
Assurance building on Cornhill, designed by J. MacVicar Anderson in 1896. It rose to seven storeys, containing space for company use and for letting.229

The more notable height effects of the lift were not in offices, but in residential buildings and hotels in Westminster. Hankey's Queen Anne Mansions was the first and the most despised of the new buildings. Considered the 'loftiest and ugliest,'230 it rose to 116 feet in 1874. An addition in 1877 surpassed even this; with eleven storeys it was 129 feet tall.231 The Army and Navy Hotel rose to 118 feet in 1882,232 while the Hotel Metropole, designed by the Francis brothers, was an unprecedented 150 feet high.233 Victoria Street was considered 'a flagrant example' of 'a great mistake in house architecture.'234 Its buildings were too lofty for the width of the street.

The concern was twofold. First was that of fire safety. London's fire brigade was not equipped to rescue people from such towering heights, and the water pressure in the mains limited the reach of hoses. Hankey had taken the precaution of installing water tanks in his mansard roofs and hydrants on every floor.235 This precaution was unusual. Hyde Park Court was referred to as a 'Tower of Babel' for its great height and for fear it would burn.236 These problems were controlled in a rudimentary manner by the building regulations through restrictions on materials, fire-resistant construction requirements, and the regulation of stairways.

The second and greater problem, and the one which could only be solved by regulating building size and shape, was the concern that the increasing size of these new buildings would diminish light and air in the streets and cause serious health problems. Building height in London had not been effectively regulated since the passage
of the 1855 MBA. The only reference to height limits was the schedule for wall thicknesses, which terminated at 100 feet.

The first regulatory response to the 'towering monsters' in Westminster was a bill in 1889 that proposed to restrict the height of buildings to the width of the street on which they fronted, or to sixty feet on streets of less than sixty feet width. 237 This was revised to seventy feet for all streets, measured from the pavement to the top of the front wall or parapet. Appeal to the council could have allowed higher buildings, a clause which The Builder thought would be severely tested in practice. 238 During the reading of the bill the Lords Select Committee raised the limit to ninety feet, with an allowance for two floors in the roof. The Committee, bowing to commercial pressure, considered that it was too late to object to high buildings in London: the land value made them necessary, and lifts made them feasible. 239

The Act of 1889 covered only building height. Its limitations were short lived, for new restrictions were incorporated in the 1894 London Building Act, the first comprehensive replacement for the hopelessly outdated 1855 MBA. The proposed act was made public in early 1892, and provoked several years of heated discussion. The most controversial provisions regulated the massing of domestic buildings, a classification which included office buildings. It was proposed to limit the building mass to less than the height of a plane projected at the 'shaving angle' of forty-five degrees from the ground at the rear property line. 240 A ten foot wide rear yard requirement was also proposed. Building height was to be restricted to seventy-five feet, with no more than two floors in the roof.

A popular rule of thumb maintained that building heights should be no more than the width of the open spaces on which they fronted.
The fear was dark streets, full of trapped 'vitiated' air. The proposed regulation would have exceeded this standard and produced rear yards twice as wide as the height of adjacent buildings. It provoked a resounding protest. Lower storey heights and extensive below ground development were predicted by the critics. Banister Fletcher, speaking at the RIBA, argued that buildings would be built with walls sloped at forty-five degree angles to maximise space while literally complying with the regulations. Most architects speaking at the RIBA and the AA were against this 'shaving angle.' It had been created with the intention of alleviating slum housing conditions, but was misapplied, the architects claimed, in business buildings. It was called 'confiscatory,' 'crippling,' 'oppressive,' and 'destructive.' The loss of floor space was projected at £11,500,000.

Some claimed that the 'shaving angle' would effectively stop building in the densest parts of London. E. T. Hall, an experienced City architect, made the case for office buildings. He directed attention to South Sea House. It was well lighted and ventilated, he claimed, but under the new clauses it could be rebuilt at only half its original size. Large buildings fronting on several streets (Great Winchester Street Buildings was cited) would have an additional problem: determination of the 'rear' was impossible. The influence and workability of 'Ancient Lights' was reiterated.
ponents of the 'shaving angle' were not insensitive to the health movement. Their position was based on the general belief that the level of hygiene of City buildings was quite acceptable, and that costs to rebuild in the proposed manner would be prohibitive. Edmund Woodthorpe, a veteran of at least thirty years of City office design, claimed 'the forty-five degree angle, particularly in the City, would defeat its own end' by bringing to a halt all new construction.

Calls for exemption of the City from the 'shaving angle' were poorly received by the LCC, which considered that idea commercially unfair to other parts of London. A proposal was made to change the 'shaving angle' to sixty-three degrees, twenty minutes, an angle which would limit building height to the dimension of open spaces. At least fifty-two petitions were lodged against various portions of the building act proposal, including those from the Surveyors Institution, the Architectural Association, the RIBA, the School Board and the Ecclesiastical Commissioners.

The final version of the 1894 LBA responded to these protests in a curious manner. Clause 5 set the 'shaving angle' at sixty-three degrees, thirty minutes for domestic buildings, and required a ten foot wide rear yard. Office buildings were exempted from these requirements, however, by a subtle change in definitions. For Clause 5 only, the expression 'domestic buildings' was not to include 'any buildings used or constructed or adapted to be used wholly or principally as offices or counting houses.' This was the first distinction made in the London Building regulations between office buildings and houses.

Whilst the net result of the Act was that offices escaped being shaped by the 'shaving angle,' the Act was to have a substantial effect on London streets. Building height for all uses was established
at eighty feet, measured to the parapet, with a maximum of two storeys in the roof, which could be sloped seventy-five degrees.\textsuperscript{251} It took several years for this envelope to be seen in overall office building form, for 'Ancient Lights' still acted as the primary control on streets where offices were built. By the twentieth century, however, the 1894 LBA had taken full control. It determined with little variation the street front profile of the bulk of the new office buildings in Westminster.

Many times during the long discussions of the 'shaving angle,' architects argued that the 'Laws of Ancient Lights' were sufficient to limit building height. While this generalisation did not apply to much of Westminster, it was certainly true in the City, where the bulk of new office construction still remained. John Whichcord had noted in 1882 that rebuilding of virtually every building involved at least one 'Ancient Lights' problem.\textsuperscript{252} The laws themselves continued their erratic development. Discussions to modify or control the laws were a regular feature at the RIBA from the 1880's through the end of the century.

The Builder noted in 1886 that 'no branch of law has been more completely created by judicial decisions in recent years than that concerned with the laws of light.'\textsuperscript{253} The general trends included accepting geometric measurement of obstructed sky area as a basis of claims and expert testimony. The forty-five degree easement angle was still common, and still controversial. Reflected light remained outside the range of considerations in legal settlements. A relaxation in the strictness of court settlements was noted by 1877, but this was reversed by 1887.\textsuperscript{254} By 1900 it was relaxed again.\textsuperscript{255}

Concern at the RIBA was such that in 1881 the Special Committee on Light and Air was established. Chaired by John Whichcord, it was
to study the problem and make 'such practical suggestions with respect thereto as may seem expedient.' The concerns and beliefs of the committee members expressed the continuing controversy. T. C. Clarke called for the abolition of 'Ancient Lights' controls. Edward Clifton argued the opposite point and praised 'Ancient Lights' for prohibiting more buildings such as Queen Anne Mansions. Whichcord thought the forty-five degree angle rule of thumb should become a universal law, not just a standard measurement. Robert Kerr believed modification of the theoretical aspects of the law was neither advisable nor possible. He advised architects to promote greater understanding and concurrence on the practical issues. The committee's first report, issued in 1882, covered primarily procedural matters. It called for the establishment of a tribunal to replace the courts as an expedient in resolving disputes. The recommendations were never acted upon by the RIBA. The committee issued a final report in 1888 which was largely embodied in the Science Committee Report of 1893. By this time, in addition to the procedural issues, the recommendations called for an end to rights of light for buildings erected after some unspecified future date. This last provision, extreme as it was, was consistent with the attitudes of many architects. William White had called for an end to 'Ancient Lights' in 1881; he proposed that each building be dependent on its own site for lighting. J. J. Stevenson allowed that some regulation of building height was necessary, but 'Ancient Lights' acted in a 'perfectly haphazard and irregular manner, depending more on accident...stealing a neighbour's property if he does not look out, at cost and trouble to himself, to prevent it.' George Truefitt also favoured their abolition. A communication from the Manchester Society of Architects to the RIBA in 1888 called for the elimination
of rights on new buildings. 263 John Holden and R. E. Pownall con-
curred. 264 Arthur Cates cited the 'mischievous and unjust action of
the law' and called for the 'abolition of the tyranny and blackmail-
ing perpetrated under the sanction of the present law of light.' 265

Nothing resulted from the protests of these and other men, or
the 1893 Committee Report. Efforts had been underway, however, in
Westminster to diminish the effects of the laws. Starting in 1870
the Crown Estate required its ground tenants to forfeit all claims
against other Crown tenants. By 1900 this practice was said to be
common on most of the larger London estates, with no ill effects.
'Litigation has been prevented, but the development of the estates
has not been impeded by rapacations of cantankerous owners of domi-
nant lights.' 266 The rents obtained were said not to be diminished,
either. While this apparently happy resolution was acknowledged by
many, it had no impact on the laws in general, and became instead
just another episode in the continuing saga of 'Ancient Lights.'

Building Profile

Whilst the 'Ancient Lights' problems in Westminster may have been
resolved to reasonable satisfaction, in the City they remained the
major control of both building height and wall profile. Most office
buildings built prior to the late 1870's were supported and enclosed
by masonry bearing walls. Generally these walls were built in con-
tinuous planes from foundation to parapet, resulting in building
massing that approximated relatively simple solids. Even in cases
restricted by 'Ancient Lights,' such as the General Credit Discount
Company, or the City Offices Company building at 28 Clements Lane,
mentioned earlier, building height was set at the maximum height
the exterior wall could rise as a simple plane.
As land costs rose and buildings began to reach unprecedented heights, responses such as these became increasingly inefficient and expensive. In the case of Delissa Joseph's West India House, built on Leadenhall Street in 1895, the result was ugly as well. A suit brought against the building owner during construction prohibited the street facade from being built as intended. Last minute modifications were done in a pre-1880 manner. The top floors of a portion of the building were omitted, with the remaining portion built as planned. This left the building looking very imbalanced and oddly asymmetrical.

After 1880 increased land costs and building pressures made such a response expensive. Instead, architects began to step office wall profiles back at each floor.

This was evident in another building by Joseph, St. George's House, built on Eastcheap in 1888. Whilst the front facade soared in a
single plane to six storeys, the rear was stepped, apparently to respect 'Ancient Lights' across narrow George Lane. Each floor above the third was set back five feet from the one below. A similar profile but with 'considerable ingenuity in arrangement and construction' was utilised at the rear of 16 Tokenhouse Yard, designed in 1880 by E. Bassett Keeling. He stepped his floors back, but took the opportunity to enhance the lighting level in the offices by the liberal use of curved glasshouse-like windows. The illustrations were shown by The Builder 'as they may prove suggestive in other cases.' Apparently they were. A similar scheme was incorporated in a small building at 3/5 Rood Lane, designed in 1899 by Edward A. Ellis. The building height was limited to forty-two feet by an agreement to respect a 42 degree angle projected from the head of a first floor window across the narrow Rood Lane. The limited volume available within this low height was maximised by the stepped profile, covered with glass in a rather awkward copy of Keeling's example.

The practice of stepped walls was legally questionable. It required placing exterior walls on bressummers, a condition that was not sanctioned until the 1894 LBA. Keeling's wall was additionally substandard, for its nine inch width failed to meet minimum thickness requirements of the 1855 MBA.

T. C. Collcutt's City Bank on Ludgate Hill had similar 'Ancient Lights' problems but solved them with a different profile. The building was admired when built by the critic H. H. Statham. He was apparently unconcerned with the rear of the building, where awkward massing marked an 'Ancient Lights' settlement line. Taken to court by the Vintner's Company, the City Bank was 'perpetually restrained from erecting any buildings on their land on the north side of Pilgrim Street...of a greater height than the height
of the buildings which formerly stood thereon and were pulled down by the Commissioners of Sewers in the year 1889. To Collcutt's credit, the fact that the court decision came in the month that the building was scheduled to be completed may have had much to do with its finished appearance at the rear.

Stepped wall profiles were commonplace by the end of the century. In these last twenty years of the century, facilitated by lifts and stimulated by rising land values, offices rose to fill out almost every available inch of buildable volume. Changes were in effect in other aspects of office buildings in addition, because changing office work patterns, as well as the lift and economic pressures, brought about planning changes.

**Building Planning**

Distinctions between different types of office buildings that existed up to 1880 became increasingly blurred by the end of the century. As administrative staffs of banks and insurance companies grew, so did their need for small offices. Public offices, relatively unchanged in size from the 1860's, became only small parts of banks and insurance buildings. Spaces that earlier would have been offices to let above public halls became integral parts of bank and insurance operations. Solicitors' offices, which had been designed along the lines of the 1843 Staples Inn Chambers, began to employ techniques pioneered in offices to let. By the mid-1880's, mention of buildings planned specifically for solicitors ceased.

Banks and insurance companies were no longer the major builders in the City. Offices to let were constructed in increasing numbers, and must have become more numerous than any other type of office building. The 1891 census indicated seven times as many clerks in
commercial work as in banks and insurance offices. The total clerks in 1891 represented a fourfold increase over the number in 1851; by 1901 it was a sixfold increase.

In the City pressing demands on available light brought about a further increase in the size of window openings. Bank facades at times displayed the solid-void proportions once reserved for offices to let. Organisational changes were stimulated by the lift and the virtually new presence of women in offices.

The question of how to integrate the lift was never a very difficult one. From the very beginning it was almost universally placed in the well hole of stairs. This was a compact arrangement that minimised framing problems and gave the tenants easy choice should they fear the lift or should it break down. Additionally, in an age before electricity, the location guaranteed adequate light to the lift car.

Of the various planning approaches in mid-Victorian office buildings, the double loaded corridor schemes became the most common with the lifts. The arrangement of Delissa Joseph's St. George's House was representative. The centrally located lift served all rooms quite adequately. Larger buildings had problems in the walking distance from the lift. The petition of tenants in the Palmerston Buildings and the company response of installing a second lift far away from the first has already been noted. The Great Winchester Street Buildings showed the limitations of an efficient walk up organisation when adapted to lift use. The four separate corridor systems each received a lift. The number had to be excessive. William Pilkington's similarly sized Winchester House, built in 1886 across the street, required only two. They were located as far apart as possible. These plan arrangements were perhaps not highly thought out. By the 1890's notice was taken that Americans consider-
ed it a mistake to locate multiple elevators far apart, and by the turn of the century the 'comparatively new arrangement' of clustering lifts was being incorporated in City offices.

Concurrent with the general acceptance of the lift was the introduction of the typewriter into business offices. Women clerks, equipped with a basic education following the Education Act of 1870, were immediately associated with this tool. 'Typewriters,' as these women were called, were said to excel on the machine. Their reported numbers in offices swelled from only 19 in 1851, to 17,800 in 1891, and over 177,000 in 1911. In an age before acoustical controls, typewriters presented a problem in offices that could only be resolved by their isolation from other clerical tasks. Thus women 'typewriters' were separated from their male co-workers whenever possible. Social conventions supported this notion; an office with separate working spaces was deemed a better place to work than one which mixed males and females. In larger organisations with clerical functions spread over several floors, the lift made it possible to establish a centralised typing room. The Commercial Union Assurance Building, for example, had five floors of company offices. Located on the relatively undesirable fourth floor, one 'typewriter' room served the entire building. This practice was common at least until the First World War; similar arrangements were included in the Phoenix, the Royal Insurance Company and the Chartered Bank of India.

Another change in office building planning related to lifts, and to a degree with the arrival of women clerks, was in the provision and location of toilets. In the first rush of office construction in the 1860's they had been provided in a variety of locations; wherever room was available and ventilation adequate, but always
readily accessible. Shaw distributed them in nooks and residual spaces in New Zealand Chambers, but there was one on every floor. I'Anson's Colonial Chambers had them in a stack within an area. Whichcord provided them under landings and in stacks at each stair in 9 Mincing Lane. No special accommodation for women was made in these buildings, and during the early years of women in the work force, the facilities most likely were shared. The management of the Palmerston Buildings, for example, didn't provide separate accommodation for women until 1902, and then only when tenants demanded it.285

The new buildings provided toilets that maximised the available high rent spaces while simultaneously contradicting the general caution toward lifts. The toilets were commonly relegated to either the basement or the top storey, the floors which produced the least rent. A preferred arrangement placed men's at one end and women's at the other.286 Surely such an arrangement must have increased lift traffic.

In some buildings another method of maximising rental return was evident. Insurance offices had increasing need for small non-public offices. The larger insurance companies had a number of relatively self-contained departments. The spaces built earlier for return on investment came to be regarded as expansion space. The pattern of space allocation in several buildings correlated quite closely with the rental potential of space to let. One building organisation which allowed the largest return on investment, but also contiguous insurance office floors required two lifts and allocated portions of each upper floor for both insurance and rental purposes. Webb and Bell's Metropolitan Life Building, 1894,287 J. M. Anderson's Commercial Union,288 both in the City, and J. F. Doyle's Royal Insurance
Building\textsuperscript{289} in Liverpool employed this strategy. The Northern Assurance Co. in the City went even farther by dispensing with the contiguous floor concept. E. W. Mountford located the storage rooms and toilets below ground, and the general office on the ground floor. The clerical staff, however, was located on the fourth and fifth floors, above the three floors of offices to let which commanded the most lucrative rents.\textsuperscript{290}

In the closing Victorian years insurance companies enjoyed a period of rapid growth and amalgamation.\textsuperscript{291} The larger companies could build and fill buildings which were able to compete with public buildings in size and stature. The most notable were the Prudential Buildings on Holborn, designed by Alfred Waterhouse and built between 1879 and 1899,\textsuperscript{292} and the Refuge Assurance Building on Oxford Street in Manchester, also designed by Waterhouse. The Prudential covered a whole block. With rows of office spaces fronting on areas, it was much like any other large block in London, except the office spaces were larger. The Refuge, however, had unusually large clerical spaces. The ground floor office was huge, measuring over eighty feet by 100 feet. (2-87) It was centrally lit by a large glass rooflight at the base of an area. (2-88) Here the practical Waterhouse created a public clerical space that was just one step removed from being purely utilitarian; only at the end did an arcade enhance the otherwise unadorned space.

Whilst insurance offices were undergoing a transformation in office organisation, the solicitor's office completely transformed and perhaps reached extinction as a separate building type. The planning of the 1843 Staples Inn Chambers, with rooms arranged around a stair, has been noted. Related to the colleges at universities, the pattern remained viable for new solicitors' chambers for thirty-five
years. When Banks and Barry designed Westminster Chambers in 1863, they arranged suites of rooms off the stairs. With the large size of the building and its long frontage on Victoria Street, the system produced nine separate entries. (2-89) The Builder noted that office spaces available near the Parliament and Courts of Law were 'very inconvenient from the unsuitability of rooms originally intended for domestic accommodation being applied to the purposes of professional offices,' but Banks and Barry continued the well-established residential pattern here.

Other well-known architects produced similar designs. Ten years later G. G. Scott designed a five-storey building at Lincoln's Inn Fields, organised with rooms for barristers, pupils, and clerks in suites off of three staircases. When Alfred Waterhouse built on nearby Carey Street in 1878, he followed the university model even more closely. His building consisted of twelve separate houses, each self-contained, forming a quadrangle. Access to the houses was only through the quadrangle. Temple Gardens was built along similar lines in 1879. Designed by E. M. Barry, the offices were located in two buildings. Corner turrets of the chateau style building disguised the irregularity of the site, but squeezed the clerks into round rooms less than eight feet across. Properly locating a desk must have been a difficult task. A similar planning approach, but
without the turrets was followed by J. P. St. Aubyn on an adjacent site in the Middle Temple in 1883. This was the last building noted to follow the university pattern. Certainly offices for solicitors continued to be built. Most likely entire buildings were seldom required. Also, the more efficient and flexible planning approaches developed in the City offered more advantages than the university derived model.

The Royal Courts of Justice Chambers, built across the street from the new Royal Courts of Justice, in the same year as St. Aubyn's Middle Temple building, brought City design to the solicitors. The architects were William Wimble and Goymour Cuthbert, both experienced City practitioners. The building was impressive for its size, covering a 10,000 square foot site with seven floors and two basements. Special accommodation for solicitors was provided by the deed box lifts and the first floor club, but beyond these the building could have been a typical City office to let. Both solicitors and private companies found accommodation here. Office spaces were arranged along double loaded corridors. As in Whichcord's 9 Mincing Lane, no lateral partitions were built until the tenants' needs were established. Partitioning was then done in fourteen foot modules, each module receiving one fireplace and one glass door to the corridor. Undoubtedly the building was well-known to solicitors. Its location was quite memorable; its construction and planning were meritorious enough to warrant an AA visit. Undoubtedly it influenced the future planning of solicitors chambers and provoked their eventual disappearance as a distinct type of office. No others on the university model were noted.

If the Royal Courts of Justice Chambers showed the way to accommodate solicitors in an efficient and flexible manner, it also
gave a superlative demonstration of a feature which was to become common in office buildings: extensive below ground space. The Justice Chambers' two basements were used for storage and machinery and as a restaurant. The latter was designed like a Norman crypt. The double basement was not unique, having been employed on occasion since the 1860's. As has been noted, the City Offices Company had a double basement in its 39 Lombard Street building. The stimulus for that sub-basement was the high cost of land on Lombard Street and the demand for secure stores. As City pressures continued to mount, and as lofty building proposals met with resistance of 'Ancient Lights,' construction of double basements became common. Approximately one quarter of office buildings built in the City in the last two decades of the century employed them.

It is difficult to understand how the two sub-basements of 39 Lombard could have been anything but damp and dark. They had no special ventilation and required the use of gas burners for lighting. Perhaps this was why the City Offices Company had difficulty letting them. The Royal Courts of Justice Chambers incorporated an improvement in the form of Boyle's Patented Ventilators. Developed along the lines of ship vents, they were connected to a 'ventilating pump' on the roof. Neither of these buildings, however, had office uses below ground, but many that followed did. Equipment and services that might have been in the basement in 1860, such as the heater, strong rooms, or clerks lavatories, were either dropped a level below or simply placed in darker spaces toward the rear. Offices to let could include a shop front or public office on the ground floor, and still get rental office income from the basement. On a small building this could amount to a 20% increase in lettable area. But it could not have been accomplished without adequate natural
lighting and careful planning. One City office specialist, H. C. Clarke, claimed to be able to light basements 'practically as good as ground floor offices.' Clarke's claim was based on his use of splayed white glazed walls. More commonly this was achieved indirectly, through 'assisted' natural lighting.

The assistance was provided by pavement lights. Initially employed in ships, these devices first made their appearance in offices around 1880. They were available from a number of patentees. One of them, Thaddeus Hyatt, was an early promoter of concrete construction. By employing lenses or mirrors, light was filtered through glass pavement blocks and directed horizontally below ground. Elevated ground floors had been employed since the 1860's to increase basement lighting, especially in offices to let. The advantage pavement lenses had over this approach was they intercepted light on a plane directly exposed to the sky surface, and thus were more effective illuminators. They also allowed pavement level shops or offices. Hayward's prisms were said to throw light thirty feet deep into basement offices. One installation was claimed to be so effective the clerks had to orient their desks away from the light rather than toward it.

Two buildings built by Trollope and Colls were representative of these installations. Edward Ellis's 3/5 Rood Lane utilised a splayed basement wall and a raised bulkhead to enhance the basement lighting. A sense of massiveness of the building was maintained by arching stone over the bulkheads. Care had to be taken in the framing of the ground floor: any beams projecting below the ceiling line would have severely diminished the lighting level by creating shadows. Another small building, for Messrs. Hales and Sons on Lime Street, extended the principle one step further. Here the splayed basement
wall was extended all the way across the facade, with cast iron 
brackets providing increased strength for the iron stanchions at 
regular intervals. (2-92)

Whilst efforts to achieve adequate lighting such as these 
were evident in spaces below ground, architects were responding to 
increased lighting needs above ground as well. As buildings grew 
loftier, available light in the streets was becoming a rarer commod-
ity. In the 1860's it was common for speculative offices to have 
extremely large windows, whilst banks and insurance companies pre-
ferred the substance and style of a massive facade. Even when ground 
floor spaces required large openings, such as on narrow City streets, 
the upper floors remained reasonably solid. By the last quarter of 
the century this was no longer the case. Stylistic standards had been 
broken by buildings such as New Zealand Chambers, but the new stylistic 
tolerance only reinforced functional needs and contextural pressures. 
'We have no longer mass or solidity and repose, which could only be 
attained under the old classical formula, but we have variety, play 
of light and shade, increase of lighting to our town buildings. 
These are the differentia of modern town architecture which are des-
tined to form a new style,' 311 the Building News editorialised. Build-
ings such as Basil Champney's delightful little Swan Buildings in the 
City showed very well how to make virtually glass walls. (2-93) 
Token House, by T. Barnes Williams, did the same in a modern French 
style. (2-94)

By the 1880's the window sizes of offices to let were matched 
by banks and insurance companies in the City and in the provinces. 
The Commercial Banking Co. of Sydney was almost all columns. (2-95) 
Webb and Bell's sophisticated Metropolitan Life Assurance Society had 
virtual walls of windows, (2-96) as did T. C. Clarke's London and
Lancashire Office on Cornhill, and T. H. Smith's National Bank of India. In Liverpool three insurance offices on Castle Street, designed by Grayson and Ould over the quarter of a century before 1887, were a graphic comparison of changing response to lighting needs. In Manchester Charles Heathcote's Lancashire and Yorkshire Bank, at the head of King Street, showed just how large such window openings could be.

CONCLUSION

Through efforts to gain added utilisation, the late Victorian office building was noticeably different than its predecessor of only thirty years. The changes made were not extreme in any single way. For the most part they were extensions and refinements of earlier practices, forced by urban pressures and made possible through changes in technology. Larger windows, pavement lights, lifts, and a few extra floors when taken separately were simple modifications. When added together, they made these buildings a distinct group. In their forms and organisation they embodied the two most important aspects of Victorian office planning: the response to natural lighting, and the maximisation of building area on expensive sites.

By Edward's reign these buildings would be out of date. Land costs and lighting would still be prime considerations, but they would be joined by others, both functional and stylistic, that were to make twentieth century office buildings very different from their Victorian predecessors.
EVOLUTION OF STRUCTURE

FIREPROOF CONSTRUCTION

Theoretical and material problems

Theory solved

National Safe Deposit Co.

Patent 'fireproof' floors

Timber floors

FRAMING SYSTEMS

Problems with iron

Masonry bearing walls & fireproof floors

Criticism of American framing

Full framing in stone

Concrete framing

Cast iron internal framing

Wrought iron columns

Steel columns

Cast iron beams

Wrought iron beams

Steel beams

The diagram illustrates the evolution of structural systems from timber floors to steel columns. It highlights the development of fireproof construction methods and the introduction of new framing systems like cast iron and concrete.

1840 1850 1860 1870 1880 1890 1900 1910 1920

1855 MBA

1894 LBA

1909 LBA
CHAPTER 3

VICTORIAN STRUCTURE:

NEW STRUCTURE FOR NEW USES

The importance of Victorian structural developments to modern architecture is now so well recognised as to be without question. Historians, particularly Giedion and Hitchcock, have traced the use of iron and later steel, and developed a genealogy of buildings exhibiting increasingly more complete use of the new materials. Hitchcock attended to relatively common developments such as iron lintels. Giedion, on the other hand, moved from one individual accomplishment to another and, as a result, delivered a partially imbalanced view of nineteenth century developments. Celebrated buildings such as the Crystal Palace were as important in their own time as they are today, but their connection to standard architectural practice of the period was not as strong as might be believed. A history of more conventional buildings is quite different.

The relationship was noted in 1860 by Thomas Blashill, speaking at the AA.

It was imagined that (the Crystal Palace) would revolutionise the whole system of architecture. Such an idea might be expected to vanish, but much that is really valuable to us both as example and warning remains. I am inclined to think that the problem of iron in architecture will not be worked out chiefly in buildings of this size and character; we shall probably make most of our real progress by means of many experiments in buildings designed on a smaller scale, and for varied uses. Crystal Palaces will arise at intervals and mark epochs in the progress of architecture, but
the progress itself will be made in the daily practice of our profession.¹

Blashill's point is worthy of emphasis. In Victorian Britain there was considerable doubt as to the actual progress shown by the Crystal Palace. At the same time more conventional building design underwent considerable change. Structural theory and practice evolved from traditional rule of thumb design, through considerable trials, to the beginnings of modern engineering, construction and embryonically, expression. Structural developments in office buildings form a part of this more modest but practical history. Historical attention to this area in general, and offices in particular, has been slight.

In offices the two critical nineteenth century structural issues were fire-resistant construction, particularly in floors, and the refinement of the use of columns as main points of support. Henry-Russell Hitchcock's works have analysed these points in relation to stylistic issues, but he overestimates the extent to which internal iron framing was employed, and the extent to which its expression was a concern of architects of the day.² Andrew Saint shows a misunderstanding about the London Building Act's requirements for protecting iron framing.³ S. B. Hamilton's research is perhaps the most thorough in identifying specific developments of fire protection, but it doesn't establish degrees of use, and tends to focus solely on structural successes.⁴ This is not a major flaw in so short a work, but the evolution of structures was as much grounded in uncertainty and failure as it was in success.

Through the Victorian years knowledge was accumulated, tested in practice, and occasionally enforced in the building regulations. After many trials and considerable uncertainty, a theoretical basis was defined. By the last decades of the century, 'fireproofing' and
internal columns were common, and the major structural issues, at least temporarily, were resolved.

Columns and Piers

In mid-nineteenth century Britain the highest quality method of construction was based on centuries of tradition. It featured stone and brick external walls, vaulted masonry, double-framed timber floors and interior partitions with orderly, relatively small openings. Such methods may have worked well for the country house or public building, but the exigencies of building in crowded cities, the demands of new functions, and the cost involved made such methods unfeasible in office buildings. Instead Victorian designers progressed through a variety of theories and techniques, each one attempting to provide stability, durability, and fire safety with function and economy.

Since the Great Fire of London the brick wall had been the staple of building construction. When built well it undoubtedly was highly effective for fire safety. A key to quality brick construction was included among T. L. Donaldson's maxims: 'Voids over voids, and solids under solids.' With offices this was not always possible. The shop front was the problem. It grew in size late in the Georgian period. Stimulated by law changes and decreasing plate glass prices, shop fronts became the bane of Victorian street architecture. An early response was seen in two offices on Threadneedle Street in 1855. (3-1) The stylistic treatment of shop fronts was never comfortably resolved in the century, but it was the structural uncertainty that most concerned early critics. William Hosking, a professor at Kings College London, complained in 1848 that 'The very common practice... of omitting or removing the outer walls throughout the ground floor
storey...is so fraught with danger as to make it a matter of wonder to all who know (by) what a thread such buildings hang, that casualties from this cause are not of more frequent occurrence." Such openings were commonly framed with cast iron, a practice Hosking called an 'unchecked source of danger.' More critical and certainly more graphic were the comments of Alfred Bartholomew, whose Hints Concerning the Construction of Fire Proof Buildings was first published in 1839. The book remained a staple reference throughout the century. Bartholomew wrote to 'awaken national attention to the fractured and decaying condition...of an extensive portion of our modern edifices, public and private.' Among the many points in his argument, he considered the use of bressumbers 'wholly inadmissible.' A few years later he noted 'the two huge ruinous cracks which are found over most shop-fronts, like the deep lines in an aged man's face.' Bartholomew's solution was to minimise the bearing on the bressummer by means of a relieving arch, even if it had to rise through a full storey above to cover the span. The Builder thought 'much (of Bartholomew's work) will never be out of date,' but office building architects in general ignored his advice.

Cast iron columns were common for shop fronts for the rest of the century. When larger supports could be tolerated, granite piers were used. First employed by J. J. Cole on an office in Throgmorton Street in 1854, granite quickly became a City standard. Even when the design apparently followed Bartholomew's dictate of a large arch, iron could be found behind. Henry Baker's English, Scottish and Australian Chartered Bank, with a very narrow front on Cornhill, was built with a double iron bressummer behind its cut stone ground floor arch. The alignments of the wall in section reveal that the
wall above was supported with the bressummer, which also formed a convenient pocket to disguise the ubiquitous roll-up shutter. One of the most visible examples of such bressummers supporting several storeys of masonry wall was the Belchers' Mansion House Buildings, built diagonally across from the Bank in 1871. (3-4) By this time cast iron beams had been superceded by wrought iron, but cast iron continued to be used in columns. The difficulties of support remained the same. The Belchers employed cast columns in a variety of shapes. They bedded a double bressumer in stone at the first floor line. Such practice was common: it was believed the iron acted as an important bond around the building perimeter. 15

Iron supports were a common focus of criticism. The Builder in 1870 called for an end to the 'erection of...marvelous webs of iron and glass which in the streets of certain towns we have seen towering from pavement to cornice.' It argued that 'shop fronts (should) be compelled to rest in all cases on adequate brick or steel piers.' 16 E. M. Barry thought that not one person in a thousand, who uses these shops, gives a thought to their instability, notwithstanding the warnings which now and again have been given by the sudden fall of such buildings, carrying too often death and destruction with them.' 17

Concerns such as these remained until the end of the century, and with good reason. The standard method of cast iron column and stanchion construction consisted of storey high supports, interrupted by beam connections unable to withstand large moment stresses. (3-5) (3-6) Diagonal bracing was accomplished by party walls and ground floor walls, but the latter were often notoriously lacking. Alarm was expressed in 1892 over the 'enormous brick and stone buildings, standing entirely upon iron legs.' 18 This notice could have
described many office buildings. The speaker placed his hopes in the building act then under consideration, but if anything the 1894 LBA merely sanctioned the practice. The 1855 MBA had required that the total aggregate area of openings in an external wall be less than half the wall area. When opening up a large ground floor opening, architects were supposed to account for it by reducing the sizes of openings above. The strictest interpretation of the act would have eliminated the practice altogether, for the measurements of openings were to be made on a floor by floor basis. To circumvent the MBA, some argued that a bressummer was a foundation for the wall above, and the ground floor did not count in the wall calculation. The 1894 LBA in essence followed this concept. Ground floor openings were no longer included in the wall area calculation.

Liverpool was the other major city to regulate openings. The Liverpool Building Acts approached the problem in a more reasonable manner. Wall thicknesses had been scheduled since at least 1839, and in 1882 shop openings were controlled. The regulations of that year limited openings in external walls to five-sixths of the length of the wall, not an insignificant amount. This could be further reduced if the scheduled thickness was increased and the horizontal cross-sectional area of each pier maintained. The 1889 regulations were more conservative. The maximum opening was reduced to seventy-five percent of the wall length.

Whilst cast iron supports were initially used for shop fronts, they were quickly applied to warehouse construction in the City and, by the mid-1850's, to the complete internal framing in office buildings. Two early buildings by City specialists must have shown the way. Edward I'Anson's extension of the shop front principle to the entire facade and through each 'stack' of his Colonial Chambers in 128
1857 has been noted. (2-25) (2-26) He made liberal use of cast iron columns, interposed with carved stone pieces. The result was a shockingly extensive amount of glass on all floors, in effect a four storey shop front. The minimal supports were carried throughout the building; only stanchions were left within the offices. The plate glass walls separating office spaces were nonstructural. They must have allowed changes to meet tenant needs.

An equally clever exploitation of the possibilities of iron construction was practised by John Whichcord just a year later. His block of offices on Water Lane, off Cannon Street, employed full column supports within the office areas. On the external wall he employed alternating cast iron and stone columns. Iron bressumbers at each floor reduced the wall thickness to no more than that required for a single storey. Each wall was, in effect, a stack of one storey high walls. (3-7) The pièce de résistance of the scheme was Whichcord's decoration. In a logical extension of I'Anson's use of white glazed tiles, he used red, white, and blue wall tiles, some with ornamentation, arranged in patterns between piers. This was the only relief for the otherwise flat walls.

These were among the first of doubtless scores of office buildings constructed with internal stanchions. The technique was questioned as much as that of iron shop fronts. The Building News, aghast at the practice, compared it to cast iron use in America. It lamented that should the fronts be removed, 'it is to be feared there could be little to choose between London and New York.'

Criticism continued through the century, but little definite progress was made to encourage confidence in iron framed offices until the acceptance of steel framing in the twentieth century. Fire protection was the most important assurance of safety in full stan-
chioned buildings, but fireproofing was controversial and, in prac-
tice, such protection was often dispensed with. A related structural
issue consumed Victorian thoughts: the development of fire-
resisting floors.

FIRE-RESISTING FLOORS

The earliest office buildings were built with timber framed
floors. Cockerell, for example, used them on the London and Westmin-
ster Bank in 1838. Fifteen years later Baker framed the floors of
the English, Scottish and Australian Chartered Bank in timber.
I'Anson almost certainly did the same at Colonial Chambers, as
he did later in the British and Foreign Bible Society in 1866. By
this time, however, timber floors were challenged as unsafe.

In the 1840's a considerable amount of interest was focused on
'fireproof' floors. Provoked by the frequency of warehouse fires,
prodded by calls for sanitary housing for the labouring class, and
encouraged by news of French techniques, demands for improved fire
protection became common. John Whichcord and his sometime partner
Arthur Asphitel published a pamphlet on the subject in 1855, urging
floors done in the French method. Bartholomew called for the
'total abolition...of combustible substances' in his 1839 book,
Hints Concerning the Construction of Fire Proof Buildings. Hosking
was cautious of 'the right of every individual to devise and arrange
for convenience and economy in the erection of buildings...' but
called for the use of timber only 'in as small a degree as possible.'
He was aware, as many of his contemporaries were not yet, that the
alternative, cast iron, offered an even greater number of difficulties
than timber.

Architects were familiar with the type of fireproof floors that
had been used in Midlands mills since the turn of the century.
and which had been employed in the City for warehouses since the 1840's. Brick arches spanning between iron beams were topped with a leveling of rubble or timber. This was the type of floor employed by Henry Baker in the Holborn branch of the London and Westminster Bank in 1853, by Cockerell in the Liverpool and London Insurance Co. office in 1857, and by J. A. Picton in the Tower Buildings in Liverpool, also in 1857. This was the type of flooring that Hitchcock referred to as instrumental in determining facade expression of office buildings. It wasn't, however, often used in offices. The construction was very heavy; it was more suited to the load requirements of warehouses. I'Anson, for example, restricted its use to basements, where the cast iron performed better than other materials in resisting damp.

The Francis brothers employed a similar system in the basements of 39 Lombard Street in 1863. It consisted of concrete vaults formed on permanent shuttering, spanning between iron supports. Systems such as this were commonly employed in banks for spanning over strong rooms. An even greater guarantee of fire safety in strong rooms was the use of intersecting groin vaults, completely free of iron. Gibson employed these on The National Provincial, as did I'Anson in the basement of the British and Foreign Bible Society.

Brick vaults on iron beams were actually required in certain cases for office buildings by the 1855 MBA. The increase of multiple tenancies stimulated an extension of the party wall concept. The act required that separate sets of chambers or rooms tenanted by different persons shall, if contained in a building exceeding 3600 square feet in area, be deemed to be separate buildings, and be divided accordingly, so far as they adjoin vertically, by party walls and so far as they adjoin horizontally by party arches or fireproof floors.
'Party arches' were brick vaults on iron beams. The district surveyors interpreted and allowed variations on the 'party arch' principle, including patent floor systems. Some architects subverted the clause entirely by subdividing large buildings into areas of less than 3600 square feet superficial. This was done by Shaw at New Zealand Chambers, and was said to be done by many others. For those who believed in the need for fire protection, a better response was to use a floor system especially appropriate for offices.

French floors received considerable attention in the 1850's. Employing light iron joists bedded in plaster, the floors were said to be almost as economical as timber. A similar floor had been in use in Britain since 1833. Patented by a Dr. Fox and marketed by Messrs. Fox and Barrett, it employed a gypsum mortar spread over wood strips spanning between cast iron joists. The patentees claimed it obviated the need for insurance. Whichcord employed the system on his Water Lane buildings, as did Gingell and Lysaght a few years later in their exuberant West of England and South Wales Bank in Bristol. From these initial installations, the Fox and Barrett system came to be commonly employed in offices around the country.

The earliest competitor to the Fox and Barrett system was Dennett's system. Patented in 1854, it employed gypsum concrete with brick clinkers spanning between iron joists. Acclaimed by G. G. Scott and employed in his Government Offices, it was used as often as Fox and Barrett's in offices throughout the century.

The problem of 'fireproof' floors in these mid-Victorian years was more than a matter of selecting a patent floor. Considerable controversy surrounded the merits of these floors in general.
doubt this contributed to the easing of conscience of those who chose to build with timber. Architects complained that 'fireproof' floors cost more than wood but offered no greater security against fire. 48 Some chose to build in timber and buy fire insurance, a practice criticised by many including social reformer Edwin Chadwick. He considered the practice 'evidence of a very low social condition'. 49 Those that chose to build in wood could hardly be criticised, for at least with insurance they knew what they were buying.

During the middle Victorian years there was no certainty with fireproof floors. Instead, confusion abounded. Sir William Fairbairn was one who retained his optimism through the controversy. In his 1844 Report on the Construction of Fireproof Buildings, he argued that a 'fireproof building...is more secure in every respect.' 50 His only concern was whether it was constructed well, since cast iron required considerably more skill than timber. Fairbairn's confidence was incorporated almost verbatim in his 1854 Application of Cast and Wrought Iron to Building Purposes, 51 except that he then advocated wrought iron joists. The 1870 edition was the same.

Much of Fairbairn's argument was countered by James Braidwood, chief of the London Fire Brigade. Braidwood formed his opinions in a rational manner, keeping charts of fire locations, causes, extent, and construction methods. He shared his research through frequent lectures and in a book. 52 As brigade chief he refused to send his men in a burning 'fireproof' building. He preferred timber floors with frequent firewalls, and wood stairs to the stone ones required by the 1855 MBA. 53

Braidwood's comments encouraged distrust for fireproof floors. The term 'fireproof' became one of public ridicule, so frequently
did 'fireproof' buildings, particularly warehouses, become completely destroyed. J. B. Papworth, an experienced commercial architect, claimed that what most people called 'fireproof' materials were 'literally the least protection against fire.' \(^5\) Even insurance companies did not favour 'fireproof' construction. \(^5\)

Part of the lack of public faith stemmed directly from a misunderstanding of terms. Captain Eire Shaw, Braidwood's successor, found 'nothing but the greatest confusion...in all the terms connected with fire' in the MBA. \(^5\) Braidwood thought the public had certainly been misled by the scientific acceptance of common terms, but he did little to mollify the problem. He argued that 'fireproof' should be related not just to a construction method, but also to the type of contents. Fireproof did not mean incombustible, but only 'not very likely to be totally destroyed by fire.' \(^5\) The Building News argued in 1881 somewhat ironically 'fireproof construction must not be understood to mean a mode of constructing buildings in which no fire can arise; nor does it even imply that the buildings so called are absolutely safe from destruction or damage by fire.' \(^5\)

The confusion of terms was matched by the confusion of materials and techniques. Mr. F. Ingle, manufacturer of the Dennett and Ingle (formerly Dennett) floor, did not believe concrete was capable of withstanding fire. \(^5\) T. Hayter Lewis, in an astute presentation on fireproof floors at the RIBA in 1864, felt the same, believing that only materials which had already been burned, such as brick or slag, could be resistant to fire. \(^6\) C. F. T. Young, considered an expert on fires, believed that a small amount of water applied to a fire would produce a poisonous gas. \(^6\) Young proposed to build the roofs of buildings as holding tanks that could deluge floors below. Fairbairn proposed an elaborate system of ventilated hollow iron columns,
with tubes placed below the basement floor. Others proposed running water through hollow framing members; there seem to have been several buildings built with the method.

No real progress was made in any of these directions. The actual problem was the unprotected iron of the bottom beam flanges common to all fireproof floors, but it took considerable time for this to be understood. Waterhouse, in a retrospective comment undoubtedly related to Fairbairn, blamed the 'great authorities' whose 'teachings delayed the development of fireproofing.' Others were looking in the right direction. As early as 1847 William Smith, writing in *The Builder*, criticised Fairbairn's methods and called for the protection of the ironwork in fireproof floors. His call was unheeded. Hosking in 1848 noticed the virtue of French floors was their ironwork protected by plaster. A decade later Captain Fowke employed decorative terra cotta shielding on the lower flanges of the Fox and Barrett system he used for the South Kensington Museum. The installation was noted by *The Builder* and *The Building News*, but with little influence. *The Building News* thought it was too expensive for general introduction. A correspondent to *The Builder* in the same year made an analogy with bakers' ovens, and urged a fireclay covering for iron. T. H. Lewis suggested plaster protection in 1864, but expressed reservations about such a solution because covering one material with another contradicted the best artistic sense.

The first real progress made in either terminology or application was at the Architectural Conference of 1871. T. H. Lewis presented a paper advocating timber floors for houses and vaulted floors for warehouses. George Aitchison expressed reservations about concrete, slate and terra cotta as protecting agents. Charles Fowler made the most important contribution of the period. He proposed the term 'fire-
resisting' as a substitute for the overburdened 'fireproof,' and reviewed a selection of materials that might qualify as fire-resisting. Cast iron was not on the list, but, interestingly, wrought iron was if 'introduced in a very limited way.' He then described the Portland cement concrete floors manufactured by Messrs. Allen and Sons, consisting of rolled iron bars completely bedded in concrete. He followed the paper with an article on the subject in *The Builder* a few months later.72

Use of the term 'fireproof' and reservations about methods of achieving fire safety continued for several years.73 If anyone missed Fowler's message, they couldn't have overlooked the practical demonstration performed by John Whichcord at the National Safe Deposit Company Building in 1874.74 Its locations on prominent Queen Victoria Street near the Bank must have drawn as much notice as the coverage in the architectural journals. The arrangement of basements for 'fireproof,' theft proof storage vaults has been noted. Above was a 'fireproof' office building. Undoubtedly to allay potential criticism of the claims for 'fireproofing,' Whichcord had the structural system subjected to several days of burning in a furnace set up on the site, after which the floors were dowsed with water. The Whichcord system was similar to the old warehouse systems, except that specially shaped clay blocks fixed in cement protected the bottom flange of the iron, and formed a base for the brick vaulting. (3-12)

The system performed well indeed. Deflection of the test girders was no greater after the fire than before. The *Building News* claimed it an 'extremely successful experiment, proving beyond a doubt (the) building is constructed upon a system which has at length solved the problem of actual fireproof construction.75

This demonstration was instrumental in changing the contempo-
rary understanding of fire protection. Four years later Arthur Cates unequivocally denigrated the thought of exposing bottom flanges. The Building News proclaimed 'the architect's first duty is to imbed it (the iron) as deep as he possibly can in a different material, and not show a particle of it, as a main structural feature, either inside or outside of his building.' This was the priority, even though it violated the Puginian preference for uncovered materials. Patentees rushed to capture parts of the newly confident market; eighty were said to have been registered in the five years following Whichcord's demonstration. Even columns, never considered as critical as floors, were the subject of numerous patents.

The Fox and Barrett System was the most popular patent system prior to Whichcord's testing. It was the system most often used in office buildings as well. The system changed little in construction afterward and its use seems to have waned. Dennett and Ingle's system was improved by a casing that covered the exposed joist flanges, and became the patent system most often noted in offices to the turn of the century. Others in common use included the Homan-Rodgers and Doulton-Peto.

Perhaps more common in offices than any of the patent systems was the 'London floor.' Said to be 'largely used' in 1884, it was specifically recognised as a fire-resisting floor in the 1894 LBA. It featured the utmost of simplicity and had perhaps the greatest economy of any system. A mixture of coke breeze and Portland cement was poured in the voids between timber joists. The concrete performed no structural role; it merely kept fire away from the timber. City architect H. Chatfield Clarke strongly recommended it, calling it 'very rigid, light, and fire-resisting.' Patent fire-resisting floors still had problems that timber
floors did not have. Some floors built on the arch principle had horizontal thrusts, which needed to be countered by ties or heavy walls. In offices or dwellings, with floors let to separate parties, the noise transmission could be quite bothersome. One patentee recognised this as early as 1845, and proposed to form a vacuum in voids within his floors. A more reasonable solution was to construct floors of a variety of materials, in an attempt to absorb sounds. Another was to suspend a ceiling below the floor, but this was criticised because it created voids in which diseases might develop, and it required additional depth. The last issue was a matter of concern as early as the 1850’s, and became increasingly important as buildings rose to greater heights, and as 'Ancient Lights' pressures increased. A few inches saved in each floor thickness could be very important in a tall office block.

Hitchcock commented on the relationship between fireproof floors and external expression, arguing that the regularity of the flooring systems demanded a commensurate regularity in facades. In some cases, such as Henry Baker's London and Westminster office, this was undoubtedly true, but in offices in general the reverse seemed to be true. Patent flooring systems allowed office designers independence in the planning of their facades and in the final selection of their floors. An occasional iron beam could expediently resolve geometrically difficult conditions. For example, Edward I'Anson's framing on the British and Foreign Bible Society was generally extremely orderly, with beams bearing on piers or an occasional iron mullion. But the corner window on the street facade didn't line up with the framing, so I'Anson simply introduced an iron lintel as a bearing for a major floor girder. Cockerell employed a similar tactic on his London and Liverpool Insurance Building in Liverpool. In this case
the arcuated openings were structural, and at the third floor rear of the building the irregularities of the brick vaulted floors were resolved by an offset bearing on the arch. The Francis brothers employed a 'fireproof' floor for 39 Lombard Street, noted earlier, that was like the Dennett system except the trussed shoring was left in place and acted to support the flat plaster ceilings. The vaulted floor system spanned between iron joists at approximately four foot intervals. Although the joists bore directly on the brick and stone external wall, the module of the floors had absolutely no relationship to the pattern of window openings immediately below. The wall thickness and height accommodated the differences.

It is quite likely that these examples are not isolated exceptions. Office building construction had to proceed at a rapid rate, and decisions about what might seem to be critical relationships were not always made until the building process was well under way. Lack of coordination, such as in these examples, would also have been increased by another practice said to be common with patent floor systems. Architects would let floors out for competitive tenders. They didn't know what kind of floors they were using in a particular building until the tenders were received, well after critical dimensions were set. In cases such as these, heavy external walls would be of great advantage, for they maintained a tolerance for the variations in thickness and thrust among different patent systems. The heavy wall removed one more uncertainty in the negotiated world of office design.

CONCLUSION

With the techniques for adequately fireproofing floors finally settled by 1880, the Victorians proceeded with confidence in their
methods. But as soon as the controversy over fireproofing died down, word of American developments in structures began to reach the homeland. A new controversy over the use of full framing was about to begin. Office buildings were to be central to the argument. They were the pioneers of full framing in America, and among the first to employ the new concepts in Britain.
EVOLUTION OF SERVICES

HEATING & VENTILATION

Open fire as preferred method of heat & vent.

Central heating preferred

Practical & theoretical problems

Beehive stove

Contagion theory

Perkins high pressure hot water

Phipson hot air

Burner vents, sunburner

ARTIFICIAL ILLUMINATION

Candles

Gas burner

Incandescent mantle

Incandescent lamp

1/2 watt lamp
CHAPTER 4

VICTORIAN SERVICES:
NEW TECHNOLOGIES AND OLD STANDARDS

The nineteenth century had a dramatic need for improved building services. As the size and specialisation of buildings grew, so did the demand for new methods of heating and ventilating. The open fire, which had long sufficed for both, came to be regarded as expensive to operate, dirty, and difficult to regulate. In certain buildings, such as woollen mills and prisons, it was a safety hazard. Central heating and forced ventilation were used first in these buildings, as well as hospitals and public buildings, in the early years of the century. Various methods were tried, including hot air, hot water, and steam, and by the Victorian period most types of systems were commercially available.

The need for ventilation in office buildings was as great if not greater than that in the buildings just noted. Many Victorian offices were large enough to justify central systems. Central heating and ventilating, however, was still in the developmental stages, characterised by uncertainty, controversy and dissatisfaction. Theoretical and developmental problems abounded, and applications in offices were limited.

In contrast, the application of improved artificial lighting was almost uneventful. The gas burner, available from the early years
of the nineteenth century, was a regular feature in offices by the 1840's. Improvements in components were easily integrated into office planning. The electric light, invented and commercially available in the 1880's, made hardly any impact on offices until the closing years of the century. Distribution, technological problems and costs slowed its acceptance. The integration of the electric light in offices was a twentieth century event.

Services in Victorian office buildings is largely the story of the application of central heating and ventilating systems.

Theory and Problems

The controversy and confusion surrounding 'fireproof' construction was small compared to that related to 'warming,' as it was called, and ventilation. Disease theory, the basis of Victorian medicine, caused much of the problem. The predominant position, the miasmatic theory, contended that disease was caused by the state of the atmosphere. Carbonic acid, a minute product of respiration, was generally regarded as the primary evil. A second theory, gaining popularity in the later years, was the contingent contagionist theory. While attributing disease to a contagion, this theory believed the state of the atmosphere influenced contagion activity, and that carbonic acid was a good indicator of contagion presence. Unfortunately for science, people used their sense of smell to assess carbonic acid vitiation. A space was considered contaminated if body odors were perceptible, and large spaces with many people were particularly difficult to keep pure.

The practical effect of both theories was the same: the products of respiration were believed to cause disease. A person could die in an unventilated room, poisoned by his own breath! A legion
of doctors and scientists including David Reid, Neil Arnott, Edwin Chadwick, Captain Douglas Galton, Edmund Parkes and Dr. DeChaumond sought to solve the health problems associated with ventilation by raising public awareness through writings, inventions, installations and lectures. Whilst their positions may have varied, these theoreticians agreed on one point: they had no faith in the simple removal of hazardous products through air changes. It was well known that air flow in rooms was irregular. (4-1) Instead, the polluted air had to be diluted with a rush of fresh air! Compounding the problem was the belief that warmer air contained greater amounts of carbonic acid than colder air, and draughts were uncomfortable and possibly dangerous. For this reason, and because heat was the Victorians' primary motive power for air, warming and ventilation were inseparable considerations.

Dr. Cornelius Black expressed the theoretical goals:

No system of ventilation can be perfect which does not provide for a constant inflow into our rooms of an ample supply of fresh, pure air without draught, and for an equal outflow of the air already breathed, and of the carbonic acid generated by respiration and combustion.

These goals were universally accepted, but there was considerable disagreement on just how much fresh air was necessary. The experts' ventilation standards ranged from 2100 to 3970 cu. ft. per person per hour in hospitals; 1050 to 2970 cu. ft. per person per hour in barracks; 420 to 1050 cu. ft. per person per hour in schools; and 525 to 1400 cu. ft. per hour per person in houses. Not one of the medical men established any standard for offices.

Building installations did little to settle the issues. The task of providing sufficient air, at the right temperature, without draughts, was a real test for available technology. The success of installations in public buildings was constantly debated. Some, such
as the system in the Houses of Parliament, were notorious failures. A survey of 200 public halls in 1858 revealed only six with effective ventilation. A few, like Reid's St. George's Hall in Liverpool, were generally considered successful. The Builder summed up the rest: 'a large majority of our public halls are both expensive and inconvenient, and...the public are poisoned in the bargain.'

The controversy was never settled in the Victorian years. While there was considerable agreement that a warming and ventilation problem existed, there was continued disagreement about the particulars, and a justified caution and disappointment about many of the installations.

Although generally neglected by the leading health theorists, problems in offices were as acute as in public buildings. C. Turner Thackrah, writing in his 1831 Effects of the Principal Arts, Trades, and Professions on Health and Longevity explained:

Clerks, Bookkeepers, Accountants - suffer from confined atmosphere, and fixed position. Spending most of their day in one apartment, they breathe impure air. Their muscles are distressed by the maintenance of one posture, they especially complain of pain in the chest...The digestive systems suffer most, a fact apparent even from the countenance and tongue. The circulation is imperfect. The head becomes affected; and though urgent disease is not produced, yet a continuance of the employment in its full extent, never fails to impair the constitution, and render the individual sickly for life.

J. W. Gilbart, in his popular treatise on banking, was adamant about ventilation:

If the air that circulates in the streets of cities and towns is impure, what must be the state of those offices or rooms where twenty or thirty persons are breathing close together during the whole of the day, and gas lights are burning during the evening: In such cases we are told that a person afflicted with consumption of the lungs may communicate the complaint to others, as they must inhale a portion of the atmosphere which he has breathed out. The air in a close office is not only rendered impure by the number of people that breathe it, and by the burning of gas, but it also contains very frequently particles of dust arising from the floor, through the number of people
constantly walking in and out. It is almost impossible for persons so circumstanced to enjoy for a length of time even moderate health. A portion of this evil may be mitigated by a good system of ventilation. To obtain this should be regarded as an object of the first importance. If a banker does not insist upon the architect performing this in the most effectual manner, he must be content to be often put to inconvenience through the illness and consequent absence of his clerks. 11

Both these attitudes were shared by B. H. Thwaite in 1881:

In few instances is the importance of ventilation more apparent than in that of offices, owing to the sedentary labour of the regular occupants; and defective ventilation, in this instance, followed, as it is, by drowsiness, headaches, and only too often by pulmonary consumption, is certainly adverse to economical management. 12

The problem common to clerks, generally labelled 'consumption,' persisted throughout the century. 13 The steps taken in office building design to improve warming and ventilation were, with few exceptions, generally very consistent. As with building form issues, the approaches taken for ventilation and warming varied with the size of the office space. In smaller offices, traditional open fire was the undisputed favourite, whilst in larger spaces, central systems in several variations were common.

Large Offices

The large Victorian office shared many qualities with the large public buildings that received much attention for their 'artificial warming and ventilation' systems. The number of clerks in a bank or insurance office could easily number twenty-five to fifty, sufficient to produce considerable amounts of 'vitiated' air. Ceilings were generally high; spaces were generally too large to be effectively served by one or even several fireplaces. Large offices, and banks in particular, had an additional problem. The large glass areas, often in the roof, produced cold radiation and convection currents referred to as the 'banker's draught.' 14 The earliest offices, like
the 1838 London and Westminster Bank, or the Phoenix Office, had 'beehive' stoves in the centre of their spaces. These soon lost popularity, as the banks and insurance offices adopted some type of central system.

The early systems used in public buildings, developed by Reid and other pioneers, unfortunately required a considerable amount of space for ducts, flues, and equipment. The Houses of Parliament, for example, had a much larger volume devoted to ventilation ducts than to usable space. St. George's Hall needed a monumental ventilating shaft in the street; the prominent tower on the Manchester Town Hall was an extract shaft. The cost and spatial inefficiencies of such systems were clearly in excess of what even the banks and insurance companies were able or willing to afford. Office building systems had to be considerably simpler.

Large offices generally employed a heating system and a separate ventilation system. Several types of heaters were used. Steam or hot water, produced in basement boilers, was distributed via pipes, or 'coils' as they were called, in the public office. An alternate system was hot air, with a basement 'cockle' stove and a duct system, sometimes pressurised by fans. Invariably the warmed air within the office was directly exhausted by extracts near the ceiling.

One of the more popular heating systems was the Perkins high pressure hot water system. Described at length by an enthusiastic Charles Richardson in 1837, the Perkins system was simple, consisting of a boiler and a closed loop of pipes. Although Perkins claimed the system was only a supplement to the open fire, its impressive list of applications in large offices suggests it was acceptable as a substitute. As early as 1840 it was already in use in the Atlas Assurance Office, the Legal and General Assurance Office, the Metro-
politan Bank, the National Bank of Scotland, The Royal Bank, and the North British Insurance Office. Thirty-four office installations were noted. The Perkins Testimonials of 1875 had an equally long list. The system, as well as other high pressure hot water systems, was not without its problems; the primary one being the high temperature of the pipes. James Braidwood, London Fire Chief, feared high pressure systems, citing problems of adjacent wood surfaces catching on fire. Heat temperature was difficult to control. Many people complained the pipes 'scorched' the air, a phenomenon believed to be related to disease.

Other systems were also in use, although very little is known about them. When the issue was discussed in the journals, generally it was only to note the presence of a 'warming' system, rather than to outline the specifics. Several, however, were available. A system employing ducts and a fan, commonly used in public buildings, was developed by Wilson Phipson. The first installation was in the early 1860's in the Bank of Baron Rothschild in the City. John Gibson used Phipson's system at the National Provincial offices in Piccadilly and in Newcastle. Haden and Son had a warming system that was used extensively in the Midlands. Another system of uncertain type was available from a Mr. Bailey and Land and Co. offered a high pressure system that competed with Perkins. Perhaps the most unusual system of all was by the Aeolus Waterspray Co., used at the Commercial Banking Co. of Sydney in the City in 1887. In this system air was drawn over dripping water to produce warm moist air. It seems that this was its only office installation.

Perhaps the most extensive, and certainly the best documented heating system was that employed by John Gibson in the home office of the National Provincial Bank in 1863. The challenge the bank presented...
was enormous: the public office, with more than 200 clerks, was the largest office in the City. The basement vaults were so extensive that they extended under most of the clerical office. Gibson placed a closed stove and a 'ventilating machine' at one end of the vaults. Hot air was blown through spaces built between the vaults and the banking hall above. The ground floor was supplied by open grates, but the basement was supplied by an ingenious arrangement of hollow columns with openings at the floor and the vault line. (4-3) Gibson maintained the traditional cheerfulness of the open fireplace by placing one in a prominent position, visible from the entry to his grand office.

Whilst his warming system was certainly the most elaborate in Victorian offices, Gibson's ventilating method was the most common for large offices. He simply placed a 'sunburner' at the top of each of the three glass domes over the banking office. (2-15)

The sunburner, invented by Mr. King at Liverpool in the late 1840's, was a simple device. (4-4) It consisted of a ring of horizontal gas jets producing considerable heat – sufficient to accelerate the 'vitiated' air into the extract shaft which was attached above. Said to be more effective as ventilators than they were as illuminators, they were also considered reasonably expensive to operate. The expense, however, was offset by their simplicity and their effectiveness. 30

One effort to find a substitute for the sunburner was by F. W. Porter. He experimented with fans run by London Hydraulic Power Company water. He tried the system twice, both times for the Union Bank. 31 At the Chancery Lane office he neatly integrated the ventilation holes into the ceiling decoration. (2-21) Such a tactic was often done to disguise the vents and thus allay fears of draughts.

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The fact that Porter apparently had no followers probably speaks for the lack of success of the system.

The heater in the basement and the sunburner at the ceiling worked well for large offices, but their application was limited. Rarely were these, or any other forms of 'artificial warming and ventilation' utilised in Victorian offices when the open fire would suffice.

**Small Offices**

The open fire was universally praised for its warmth and ventilation. Dr. David Reid, whose efforts on St. George's Hall and the Houses of Parliament attracted national attention, summed up the fire's assets in 1844:

> The peculiar advantages of a fireplace was not merely its power of warming an apartment, the circulation of air which it induces, its accessibility, and the influence of the light which it evolves; but the very grateful effect which it produces after the body has been chilled by any special cause.\(^{32}\)

E. R. Robson, who as school board architect oversaw the installation of countless central systems, complained about rising coal costs, but argued that 'the open fireplace is the favourite method, partly from the English habit, and partly from its assistance to ventilation.'\(^{33}\)

*The Builder,* summing up these and other feelings at the end of the century, proclaimed 'our national love of the open fire...is based on an instinctive, if subconscious appreciation of scientific fact.'\(^{34}\)

Praise such as this overwhelmed criticism that the open fire was dirty, expensive and hard to regulate. So strong was this appreciation that, in small offices, the fireplace was almost universal. More importantly, supplementary application of 'artificial' methods
was almost completely absent. The banks and insurance companies, always using some form of central system in the public office, were never reported to have extended their systems to their upper offices or to any offices to let within the building!

Of all the small Victorian offices mentioned in *The Builder*, only four were noted to have some form of central system. One was Union Chambers in Liverpool. Designed by David Walker in 1881, this speculative building had hot water heating, with 'special arrangements... made for ventilation, without dust or noise from open windows.' Another building appeared in *The Builder* later in the same year. Designed by J. Tillet for the Anglo-American Electric Light Company, this London office employed a favoured American principle: hot air pipes. Whilst the presence of fireplaces in Union Chambers is uncertain, the Light Company had none - only a single closed stove in the board room. The third central system was in the Hyams Building, Birmingham, designed by J. J. Bateman. It featured Mr. Jeake's warm water system. The last system was perhaps the most complicated. Temple Chambers, in Manchester, designed by Edward Hewitt, employed the Blackman air system. A fifty-four inch fan in the basement fed warm air through ducts to the ninety separate offices. Unfortunately no plans survive, but the space devoted to ducts must have been considerable.

As office buildings increased in size and height towards the end of the century, the problem of storing and carrying coal, and disposing of ashes must have become difficult. Perhaps the largest office building to rely entirely on fireplaces was Salisbury House, on Finsbury Circus, designed by Davis and Emanuel at the turn of the century. This building had 850 rooms with one fireplace per room. Its annual consumption of 350 tons of coal was delivered each summer.
and stored under the pavement. Four people in the coal stores and six more upstairs were required to distribute the coal each night. This labour intensive system continued until 1953, when central heat was finally installed. 40

Whilst the fireplace was unmatched in many respects, it did not completely rid spaces of the vitiated air from the ubiquitous gas burner. Polluting as much air as five occupants, the burner was the bane of Victorian health standards. 'A gas light without a... ventilating apparatus ought to be as unusual as a fire without a flue,' 41 claimed a Parliamentary Commission in 1857. The open fire was insufficient in venting the gas burner because its opening was so low in the room. The theoretical problem was that vitiated air from the burner had to pass over the occupants whilst being diluted and pulled out the chimney. (4-5)

One simple remedy, sanctioned by the Commission, was a simple ventilator for the chimney at the ceiling level. (4-6) A valve, for which numerous patent devices were available, was necessary to control air flow. Success was uncertain, however, as valves stuck open and required frequent cleaning. A better but more costly solution, also sanctioned by the Commission 42 as well as by Captain Galton, 43 was to build another flue adjacent to the fireplace flue, open to each office at the ceiling line. The flue, heated by the fireplace flue, had positive updraft. This solution was common in offices. It was employed by such celebrated architects as Shaw at New Zealand Chambers, and Philip Webb at 19 Lincoln's Inn Fields, 44 and by office specialists T. H. Smith and Edmund Ellis in buildings in the City. 45 A more sophisticated and expensive method utilised the extract flue, but connected it to a chamber in the ceiling with an opening above the gas burner. J. J. Cole's Capel and Co. from 1854 illustrates
the system. (4-7) John Whichcörd used it on his Water Lane offices. Its use was probably common.

No doubt much of the staying power of the fireplace in the small office was related to the absolute control exercised by the occupants of the room. Victorian central controls were rudimentary at best, and central systems would no doubt have caused considerable disagreement among the occupants over desirable settings. The Law Courts may be taken as a case in point. During the competition the architects were allowed to design the central system of the courts, but fire-places were mandatory in the private offices. It took twenty years to build the courts, and when finished, the judges were dissatisfied with the ventilation. The Builder observed each judge had his own standards. Failure was almost preordained.

CONCLUSION

The almost universal appeal of the fireplace in offices ended rather suddenly around the turn of the century. A growing awareness of office buildings in America, improvements in technology of central systems and new business attitudes brought an end to the romance and dominance of the open fire. Gone too was the cautious and partial use of central 'warming' systems. Instead the arrival of the twentieth century marked the unequivocal integration of modern heating and ventilating systems in offices.
### EVOLUTION OF STYLE

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<td>English Baroque</td>
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<td>1920</td>
<td>Free Style</td>
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### Influential Buildings

- Travellers' Club
- Govt. Offices
- New Zealand Chambers
- Colchester Town Hall
- Oxford Museum
- Ritz Hotel
- Holborn & Aldwych
- Carlton Club
- Manchester Town Hall
- Inst. Cthd. Accountants
- London & Westminster Bank

### Influential Writings

- Pugin: True Principles
- Ruskin: 7 Lamps
- Ruskin: Stone of Venice
- Scott: Remarks
- Blomfield: English Ren.
- Belcher & Macartney: English Ren.
- Belcher: Elements
- Richardson: Classic Arch.
CHAPTER 5
VICTORIAN STYLE:
DESIGN WITHIN CONSTRAINTS

Office building design forms a special chapter in Victorian architectural design. Offices were highly reflective of leading theoretical developments and stylistic trends, but the reflection was rarely a literal one, for it was constrained by contextual circumstances and demanding functional needs. In addition excellence was limited, particularly in the City, by the abilities of the 'second and third rate' architects who specialised in offices. The unusual problems involved in developing office buildings must have discouraged the more talented architects from an office design practice. John Belcher left the practice his father had started in the City and pursued a career which led to design work of national importance. Likewise, George Aitchison, after an early start in his father's footsteps and a virtuoso performance on a little office building on Mark Lane, left City practice and concentrated on work as a district surveyor, as well as intellectual duties at the Royal Academy. Undoubtedly the problems of 'Ancient Lights,' the pragmatic demands of maximising building area within narrow confines, and the constant pressure to quickly produce designs to minimise the loss of return on expensive sites, must have limited the interests of these and other architects.

There were however many events in office design which were im-
portant to Victorian architecture in general. Cockerell's early work and Shaw's New Zealand Chambers were probably the most notable. On the whole, however, Victorian office design was not really one of stellar performances. The ordinary was the rule rather than the exception. Like many other aspects of offices, stylistic developments were slow to evolve. They were, however, the most varied and at times, the most chaotic.

**STYLISTIC IDEALS**

Victorian Britain was the scene of a steady progression and a continuous conflict of architectural ideals. The Battle of Styles is probably most well known, but the Goths and the Italians were only a small part of the whole. Fully seven distinct attitudes had a noticeable influence on office design in this sixty year period. The different directions were more concurrent than sequential. Perhaps no other building type in Britain shows such a widely divergent range of styles. Expressive of the independent thinking of the times and the emerging awareness of the needs of business, the diversity was an implicit agreement among office architects to disagree.

Office architecture was never in an ideal position. It was a compromised architecture. In contrast to the architecture of labourer's housing, which might be dismissed on the grounds of economy, or speculative housing, as 'mere building,' general expectations for office buildings were high. Sufficient money was available for quality design; at times it appeared that too much was at hand. The difficulty in office design was the constant set of functional demands and contextual forces that contradicted the stylistic ideals of the period.

Victorian architectural theories were constantly in flux, but two of the most basic concepts were common to all. These were the
demand for 'truth' in construction and for visual stability. The need for 'truth', vociferously proclaimed by Pugin, and echoed by Ruskin, is well recognised as a driving force of Victorian theory. Stability was a Classic concern, a carryover from the Georgians. It affected office design from the beginning, and increased as functional requirements were gradually recognised and met. Its basis, generally overlooked, merits attention to underscore the difficulties of office design.

Joseph Gwilt outlined the philosophical argument for stability in the 1842 edition of his *Encyclopaedia of Architecture*. Gwilt argued that 'fitness', or the suitability of forms to the expression of their purpose, was the essential quality of beauty, and that 'rest, repose, stability, balance, all meaning nearly the same thing, are then the very essential ingredients in fitness; and therefore, in architectural subjects, instability, or the appearance of it, is fatal to beauty.'\(^1\) Gwilt furthermore maintained

> the most complete and perfect notion that can be conceived of stability, which is the result of equilibrium, may be derived from the contemplation of an horizontal straight line; whilst, on the contrary, of instability nothing seems more expressive than a vertical straight line.

The *Encyclopaedia*, a standard reference work of the nineteenth century, maintained this argument verbatim in the 1854 edition and, more significantly, in Wyatt Papworth's substantially edited 1888 and 1899 versions.\(^2\)

The dominance of the horizontal over the vertical, arguably one of the essential aspects of Classical architecture, was basic also to Gothic architecture as practiced by the Victorians. The Ecclesiologists were committed to a solid horizontal architecture. From the 1840's onward, their churches were dominated by low and broad
features, horizontally disposed walls, a minimum of expressed buttresses, and sheltering, simplified roof lines producing 'sublime' effects which, as Muthesius notes, became a general moral principle.³ As the Ecclesiological movement evolved into High Victorian Gothic, and that, in turn, gave way to Queen Anne and other combinations of Gothic and Classic, the essential principle of stability remained.

J. J. Stevenson, central to the development and perhaps the leading apologist of the Queen Anne movement, cited 'proportion' as the 'main element of architectural excellence.' Essential to proportion was 'ease and grace...the building must not only be secure, it must look secure.'⁴ Stevenson showed through a series of progressively enriched examples how stability could be enhanced on an ordinary street facade. (5-1) George Gilbert Scott, in his 1857 Remarks on Secular and Domestic Architecture, identified the necessary ingredients for a 'new palatial style,' one that was especially appropriate for public buildings, including banks and insurance companies. One of the major requirements was stateliness, which resulted from 'extent and elevation,' 'generosity and massiveness of construction,' 'breadth of surface and unadorned wall face,' and 'well-studied proportions.'⁵

These attitudes remained intact even into the twentieth century. J. D. Grace, writing in the RIBAJournal in 1900, identified stability as the leading motive in architecture. It was 'first and essential' to repose, which for Grace was the ultimate quality. Repose was 'the absence of anything which may cause, even for one instance, mental bewilderment.'⁶ Professor T. G. Jackson, lecturing to students at the Royal Academy, expressed the establishment's attitude toward stability by citing a tower:

Clearly what effects our estimate of the tower, even if
we are unconscious of it, is the feeling that it must stand firm, and that things stand more firmly if the base is wide, and if the centre of gravity falls within it; and that in the case of a lofty narrow building, like a tower, the equilibrium is more easily upset than in a lower one, and therefore greater precautions must be taken to make it steady. Consequently, we reserve our appeal for the outline that carries out these principles, not only practically but visibly to the eye, giving to the building that air of strength without which the design would excite no pleasure.

These expectations were held for office buildings, but in general design opportunities were restricted. The Builder noted offices 'belong to the class of domestic architecture in which at once are present the chief difficulties, and are absent some of the resources, of architectural design.' The difficulties were context and function, and even the most elaborate resources could not overcome them.

Overall proportions, so important in establishing a sense of stability, were largely circumstantial. Width was subject to property size, height was determined by economic pressures on one hand and the limitations of 'Ancient Lights' on the other. Surface relief and depth, important for stability, were limited by land costs to little more than the thickness of the wall. Architectural design was considered a question of facade design. The Building News summed up the situation with its note that restricting design to a single 'street elevation robs architecture of its solidity, and induces a kind of effect much like that of the design of machine printed fabrics.'

The devices at hand in office building design were the proportions of solids and voids, material choices, surface embellishment, decorative projections, and roofscape. Of these, the aspects that architects had the least control over, and which most directly challenged the demands for stability, were the relative proportions of solids and voids. Business pressures demanded that 'the windows
must be wide and serviceable,' resulting in an architecture 'entirely governed by the position of the floors and openings.' City practitioner T. C. Clarke lamented the 'inevitable sacrifice of the architecture for the light of the street front,' as has been noted.

Also as discussed earlier in Form, the degree to which this problem existed was related to the particular uses of the office building, and to the amount of available light in city streets.

In general banks and insurance companies had the fewest problems, especially if top lighting from a rear area provided for the needs of the ground floor office. The argument for a proper bank architecture was made by none other than the influential William Gilbart. After first noting that a bank should be in 'what is deemed the most respectable part of town,' he elaborated on the building. 'The bank itself should be a handsome building. The necessary expenditure for this purpose is no sin against economy. It is an outlay of capital to be repaid by the profits of the business that will thus be acquired.' While Gilbart was not more specific, Granville Sharp, in his 'Prize Essay of 1851' (Gilbart had offered the prize of £100), certainly was: 'The architecture of a Banking House...should be marked externally, internally, and everywhere, by Stability, as its leading feature.'

While Gilbart and Sharp were establishing the stylistic ideals for banks, a prescription for offices was made by James Knowles, Jr., later to be the editor of the Nineteenth Century Magazine. The occasion was the construction of an office of his father's design on Chancery Lane. Knowles argued: 'It is time that the better elements of mercantile life be represented in its habitations...Sober, straightforward, not ungraceful nor uncomely, are the operations of upright tradesmen; so let their offices, warehouses, and shops be substantial,
cheerfully ornamented piles.' He concluded 'there is such a correspondence between the outward forms and shows and inner feelings and emotions, in all truthful matters, that is far from a matter of indifference in what manner of form we transact our commerce.'

Concerns such as these became in practice the 'monumental prestige' identified by Hitchcock. As one contemporary at the AA stated in 1861, what was necessary in offices was a 'matter of fact appearance...modified...by ornamental features until, in superior specimens, the dignity itself is expressed by the ornament of an elaborate though grand and costly character.' The Builder concurred a few years later: architectural effect gave an impression of the stability of the concern. Inherent liabilities in massing and proportion could at least be mitigated by decorative effect.

By far the greatest problems of stability were posed by the shop front. The demands of the merchant for plate glass and minimum support were a constant source of exasperation for Victorian architects. S. B. Knight, generally sympathetic to the problems of office design, called a 'substructure of shops fatal' to architecture. T. R. Smith concurred when he cried 'there is little hope for a building which begins with a shop and endeavours to become architecture higher up.'

By the end of the century the unabashed shop front had become common, and the light blocking height of office buildings had stimulated an increase in window sizes to the point where the stability of offices was challenged at all levels. Even decoration was insufficient to maintain proper effect. The Building News summed up the situation:

Our present commercial architecture is in danger of being immolated on the altar of utility...So bewildering are the arrangements for the conduct of business and the details of special requirements, that the artistic eye is seriously oppressed and distracted...To the artistic
mind the modern commercial building is as hopeless as it can well be.\textsuperscript{20}

Whilst stability was an important issue, a representative analysis of Victorian office architecture could not dwell on that alone. Other issues were more topical and received considerably more attention. The constant parade of styles played major roles in office architecture. Their relative importance in office design was slightly different from Victorian architecture in general. Stylistic allegiances and stylistic idiosyncracies in the design of offices were extremely wide ranging. Much of this could be attributed to the architects' lack of skill or restraint, or to the conservatism of the clients. The City presented its own unique circumstances that pervaded stylistic issues, and resulted in some unusual interpretations and sleight-of-hand efforts. Street architecture attitudes played an important part in shaping individual building design; a review of these is necessary in order to understand style in context. Lastly, as buildings grew in height and architects struggled to maintain proper stylistic gestures, the issues of composition became increasingly more important.

\textbf{SURVEY OF STYLES}

John Summerson has labelled Victorian architecture 'a somewhat abstruse agency of emotional effect... (with) many architectural languages... spoken simultaneously, often in archaic dialects, with broken accents and much rhetorical improvisation.\textsuperscript{21} In office architecture the situation was this and more. The languages spoken simultaneously were often by a single architect or in a single building. The situation tends to defy neat categorisation. While all Victorian styles kept a close eye on historical models, strict adherence to precedents was never an absolute goal. There was always room for
innovation and novelty, especially when it could be argued that an
equation appropriate to use, or dignity, or even 'truth,' might
have been the object.

Important issues lie in tracing and dating office building
styles, identifying use, both in time and extent, and in analysing
the degree to which they met business needs.

Offices followed general Victorian trends but didn't exactly
mirror them. Robert Macleod's *Style and Society* outlines the major
theoretical issues of Victorian style, covering the Gothic movement,
Queen Anne, and Free styles in succession. Offices included these
and more. French Renaissance enjoyed extreme popularity; the Gothic
lasted until the twentieth century. The Classic influence never com-
pletely withered away. Factors such as these made the evolution of
office style a story separate from style in general, underscoring
Summerson's point of the multitude of architectural languages.

**The Classical Style**

Early Victorian offices were designed in the most predominant of
Georgian architectural traditions, the Classical style. While these
buildings were few in number, it is clear from their consistency
that the intentions of their designers and their clients was to ap-
proximate as much as possible the prevailing public building style.
As such they differed greatly from the 'dull hole in the wall build-
ings' associated with the worst of Georgian house architecture and
from eighteenth century business architecture, which consisted of
extended shop openings under domestic fronts. 22

A building with considerable Georgian character was India
Buildings in Liverpool, built in 1834. This was perhaps the first
office building of which graphic record remains. (2-61) Except for
the depth of its six column range, it could easily have been a part of a Westminster estate. Like so much Georgian architecture, it was stuccoed, had a rusticated base, and a very slight cornice. Another Georgian building, aspiring to the level of the best public work, was Thomas Hopper's 1838 Atlas Fire Office in the City. The main front, facing Cheapside, employed heavily architraved openings set within pilastered bays. (5-2)

A few years later in the City a building with the character of India Buildings was built for the Phoenix Assurance Office. Described as 'a reticent Classical front in the Greek mode,' it was designed by Arthur Mee, a former Soane pupil. The facade was simple and straightforward: a range of four pilasters were capped by an unadorned pediment. (5-3) Mee seems to have been hesitant about his order: the first floor window architraves overpowered the pilasters. Greek Classic of a different sort was employed by James Watson when he converted Salvador House into the National Provincial Bank in 1840. Watson's two Doric lodges, already noted, were highly reminiscent of a public building known to all Londoners - Hardwick's Euston Station. (2-4) Samuel Rowland's 1839 design for the Royal Bank of Scotland at the terminus of a narrow lane in Liverpool employed a similar approach but showed considerably more skill. Rowland placed a fluted, engaged Doric order in the basement and Ionic columns in a giant order across the first and second storeys. A similar two storey order, but topped by an entablature with pedestals, urns and a balustrade, was employed by Thomas Allason on the Alliance Assurance Office in the City. (5-4) The range here was of four Corinthian columns, irregularly spaced to accommodate a passage which bisected the building at the ground floor.

Larger and grander buildings were built in Scotland. Clarke
and Bell won a competition in 1844 for the design of two adjacent buildings in Glasgow, one of which was Merchants House. (5-5) It contained, among other uses, the National Security Savings Bank and two counting houses. Its location at the terminus of Candleriggs gave a superlative opportunity to display a Greek Ionic order of six columns and terminal pilasters over the first and second floors. This could almost have been a public building! A substantial and visually impenetrable base heightened the order, but at the expense of the entry. In Edinburgh the same year David Rhind made a similar public gesture with the George Street elevation of the Commercial Bank of Scotland. (5-6) Rhind's inspiration, however, was Roman. By setting his facade back from the street, he was able to develop a full portico of Corinthian columns, capped by a richly sculpted pediment. Shortly after on nearby St. Andrew's Square a competitor, the British Linen Bank, built a similarly Roman design by David Bryce. Instead of a pediment it featured an entablature broken round each column, crowned by sculpture, expressing aspects of trade and commerce. The design owed considerable debt to Cockerell's Royal Exchange project and Ashmolean Museum. (5-7)

While these buildings varied in skill and the amount of prestige they displayed, they all remained fairly close to their Georgian parentage and classical models. One building which did not, and which must be one of the most original and skillful of all Victorian offices, was C. R. Cockerell's design for the London and Westminster Bank. The impressive interior has already been noted. (2-10) On the exterior Cockerell achieved a grand simplicity sufficiently large in scale to hold its own against John Soane's considerably larger Bank of England across the street. Soane's facade on the Bank displayed uninterrupted wall surfaces that expressed security and stability.
Cockerell wanted to express the same for this newcomer joint stock bank, but had to light his building from the street. (5-8)

He produced what was described by a contemporary critic as 'a happy combination of simplicity and ornament, solidity and decoration.' The facade had an expression midway between wall and pier over the ground and first floors. It was 'striking in character, although it derives no aid from columns or pilasters,' and as Watkin notes, 'an essay on rustication.' Horizontal up to the first cornice, the rustication was horizontal and vertical in the attic. As if to emphasise the regularity of the piers as being all-important, the entry simply took the place of a window. Additionally the sculpture groupings punctuated the ends, instead of marking the centre. The one to the west appropriately represented Westminster, the one to the east was the City.

Cockerell followed this with another triumph in the City. This time it was for the Sun Insurance Office. In a composition just as original, he telescoped two upper floors into one with pilasters, and opened up the ground floor with huge arcuated openings. Both the openings and telescoping became common in future City offices.

The dominance of the Classical spirit shown by these buildings began to wane in the 1840's as it was challenged by Palazzo motifs, but it never really disappeared from the Victorian stylistic scene. In Liverpool Thomas Cunningham produced a front for the Commercial Bank on Castle Street that was similar to that of the nearby Royal Bank, except that it employed the Corinthian order for its three quarter columns. This was finished by 1866, and by then the quiet grace of the Classical style was decidedly out of fashion. The Builder's critic set 'aside the question of advisability of making the architectural
character of a building dependent upon features borrowed from temple architecture, ' to challenge the building's rather chaste decoration. 'No building can in our opinion, be complete as a work of art in which carving, whether in the form of floral decoration or figure sculpture, is absent...The whole thing is a mistake,' he concluded. 32

The grandest of the mid-Victorian Classical offices was John Gibson's 1863 design for the National Provincial Bank. This building has been noted for the constraints in its massing and the quality of execution of its plan. In the facade Gibson employed a Roman Corinthian order that was fully as high as his neighbour's three floors, capped by an entablature as high as another storey, and surmounted by abundant sculpted figures. (2-36)

The directors were no doubt pleased with this building, for over the next several years they commissioned Gibson for many of their provincial branches. In Newcastle Gibson responded with a dignified design employing a pilastered Doric order over a rusticated basement, capped by a simple cornice. 33 In Middlesbrough in 1874 a pediment over Tuscan columns and pilasters formed Gibson's most temple-like design. (5-11) In Stockton-on-Tees he employed an Ionic order embracing two floors over a Doric order of the same height, but which covered only the ground floor. 34 For the Westminster branch in 1873 he used the same general placement of orders, but diminished the severity with Ionic and Corinthian orders, and gave way to the contemporary Westminster fashion by incorporating some French devices: banded columns, iron railings, a mansard roof, and abundant carving. (5-12)

P. C. Hardwick's Drummonds Bank at Trafalgar Square a few years later employed classical motifs with none of the hedging shown by Gibson on nearby Piccadilly. (5-13) The contrast between the two is
instructive: private banks in London never resorted to the show characteristic of joint stock banks. Hardwick chose a simple Ionic order over a rusticated base to make reference to the nearby government buildings, in contrast to Gibson's more fashionable Classic.

The Classical style enjoyed continued popularity with Scottish architects. Campbell Douglass and Sellars produced a stately Corinthian design for the City of Glasgow Bank in 1879. (5-14) In Aberdeen, Matthews and Mackenzie employed coupled Ionic three-quarter columns over an exaggeratedly rusticated basement for the offices of the Northern Assurance Company in 1883.35 Years later Mackenzie, working alone, produced a design for a bank at Douglas which was very Cockerell-like for its use of piers and broken entablature. It lacked, however, the careful proportions of a Cockerell design; its severity was broken only by some festoons in the entablature and heavier rustication at the basement. (5-15)

The City had by this time experienced a riot of stylistic developments, but in the work of one man, J. MacVicar Anderson, the continuity of the Classical was maintained. His Commercial Bank of Scotland on Lombard Street in 1889 was a simple Palladian affair. (5-16) Its restraint in detail and proportions were emphasised by the use of polished Scottish granite for the first two storeys. His 1896 design for the Commercial Union Assurance Company on Cornhill was a reticent Roman design employing coupled Corinthian columns within a two storey recess. (5-17) The only gestures toward any common Victorian styles were the banded columns and rusticated basement, but by 1896 even these were out of date. A similar restraint and mix of models was employed by Anderson in 1903 for the British Linen Company, on Threadneedle Street, but here the columns were single and the recess less pronounced. (5-18)
The late Classical designs were, however, anomalies. The general trends in office architecture were more swayed by contemporary thinking. The first change in direction was to the Palazzo style. It came soon after Victoria was crowned.

The Palazzo Style

The developments of the Palazzo style in office buildings have been traced in general by Hitchcock, and in the City by Summerson. The analysis here will cover the highlights and add breadth to those surveys.

Charles Barry designed the Travellers' Club in 1829; within a decade it, with his later Reform Club, was considered the most appropriate model for contemporary street architecture. The case was put forward most forcefully by W. H. Leeds in his 1839 monograph on the Travellers' Club. Leeds, a correspondent to the Civil Engineer and Architects' Journal, was perhaps the leading architectural journalist of the day. He criticised the stereotyped columns and capitals, and the 'cold and bare' decoration of Classical architecture then practiced in England. Arguing that 'a style is to be judged of, not only retrospectively by what it has produced, but prospectively also, according to what it is capable of supplying,' he praised the earlier Renaissance palazzos of Florence and Rome as models for a new architecture. Leeds recommended Barry's clubhouse as an appropriate precedent for street architecture, citing its astylar mode and giant capping 'cornicione,' as well as its potential for the development of fenestration and dignified decoration. Barry had first shown how to adapt his clubhouse motifs to commercial work in a modest shop on Pall Mall. The work, however, did not display the dignity and gracefulness that Leeds was advocating: the plate glass front eroded the basement to mere rusticated piers.
The first offices to follow suit were built in 1843. In the City Henry Clutton produced a stucco version of the Travellers' Club for the Alfred Life Office. (5-19) The facade was most similar to the Club's rear facade, however, for the arcuated openings were grouped in a continuous range. Leeds had recommended just such an adaptation; The Builder, however, lamented the loss of repose that resulted in the Alfred office. 40 A much more exuberant example was Brunswick Building, designed by A. and G. Williams, built in Liverpool in the same year. Noted later as a 'milk and toast' version of the Farnese Palace, 41 it nonetheless made a considerable impression when built. The British Almanac made an exception of its general rule of publishing only public buildings, calling it 'a very great public ornament.' 42 (5-20)

By the end of the decade the Palazzo was firmly established as the leading office building style. As Barry had taken the initial step in translating the Quattrocentro palazzo to nineteenth century Pall Mall, the architects of ensuing office buildings explored the limitations of the formula while incorporating office requirements. Hitchcock has commented that in development the palazzo was either simplified or made more extravagant. This may have been true in commercial work in general, but in offices the trend was definitely the latter.

J. E. Gregan incorporated an entrance patterned after the Palazzo Pandolfini in his Sir Benjamin Heywood's Bank, in Manchester. It had the effect of strengthening the main building and articulating it from the line of street architecture. 43 When Edward Walters did the same in his Manchester and Salford Bank some years later, (5-21) the Building News judged that the device 'adds to (the building's) importance.' 44 A building on a narrow front in Moorgate employed the
Travellers' rear window motif for the second floor and its front window for the first. (5-22) Thomas Bellamy's Law Fire office was more literal: the front of this palazzo featured squareheaded openings, whilst the rear was arcuated, just like the Travellers' Club. \textsuperscript{45}

Narrow fronts posed particular problems, since much of the Palazzo style was dependent on proportions and breadth of treatment. J. A. Picton, never known for his compositional skills, showed just how difficult the task could be on the overcrowded front of the York Buildings in Liverpool. (5-23) Henry Baker's English, Scottish and Australian Chartered Bank was much more at ease, due primarily to the coupling of openings on its seventeen feet wide front. (3-3) The need for larger openings and more floors than either Barry or the Italians employed stimulated a variety of responses. William Grellier enlarged his architraved openings on the Royal Insurance Building in Liverpool to the point where little wall remained. (5-24) James Knowles's Hodgeson's Buildings could have been modelled on the Palazzo Ricardi except for the number of its floors and the proximity of the openings. (5-25) To mitigate the height problem, E. F. Law coupled the second and third floor windows of his bank in Northampton. (5-26) In the City, J. J. Cole did something similar at Capel and Co.'s offices. His first and second windows were grouped. (5-27) Hardwick squeezed a range of windows into the cornice of Jones Loyd & Co.'s bank, a practice which Leeds denigrated. (5-28)

Corner buildings posed problems for which neither Barry nor the Renaissance Italians set precedents. Sancton Wood provided his Queen's Assurance Building with a typical City corner entry, but marked it above with a two storey oriel window, (5-29) completely out of character with the style. John Gibson did almost the same in one of the most tasteful palazzos in the City. It was for the Im-
perial Insurance Office. (5-30) Instead of the corner entry, however, he simply surrounded a window with banded columns, and above marked the corner with a sculpted grouping holding the company shield.

Leeds had praised the continuity from ground to cornice that the Palazzo style offered. Exigencies of City offices caused this feature to be quickly eroded. Lighting needs were the greatest problem. The Queen's Assurance borrowed from Cockerell's Sun Office and employed a continuous range of arcuated openings for the ground floor, (5-29) as did Henry Baker's 1853 London and Westminster Holborn office. (5-31) In both of these a balustrade gingerly negotiated a junction between the palazzo above and the heads of the arches below. P. C. Hardwick was more brash with the front on Jones Loyd and Co.'s Lothbury building. (5-28) A full entablature capped a range of Doric columns and highlighted the junction between the brick above and the plate glass below. Effectively the palazzo sat on top of the order. A more intentional blending with less conventional elements was shown by J. J. Cole on Throgmorton Street. (5-27) Flat piers unarticulated from trabeated heads carried the plane of the palazzo front right down to the pavement, despite an almost complete plate glass front, pierced by a passage to the lane behind.

The Palazzo style required more discrimination and taste than was common in the commercial world, and more skill than could be commanded by many office building architects. By the 1850's it was seriously threatened as the leading style, but some relatively pure palazzos continued to be built throughout the century. I'Anson built one on Seething Lane in 1860. Done in brick, Summerson called it 'as severe as Barry.' George Street in Edinburgh contains perhaps the best palazzo collection in the country. It includes
Bryce's Western Bank, 1847, and two by Kinnear and Peddie, one at 67 George, from 1867, and another for the Bank of Scotland, built as late as 1883. (5-32) In Glasgow J. T. Rochead produced a Palazzo design in 1869 for the Bank of Scotland. Highly reminiscent of Gregan's work for the Royal, its planar wall surface had much greater integrity. (5-33)

It took a context such as that offered by Edinburgh, somewhat out of the mainstream, to maintain the Palazzo style. By the 1850's changing styles eroded away what little remained after context and functional demands had taken their toll. Ruskin's just published Seven Lamps and Stones of Venice equated architecture with decoration. Fergusson emphasised the idea in his Handbook of Architecture of 1859, and showed quite graphically how abundant ornament was entirely appropriate for banks and offices. The Builder concurred, arguing 'some sort of architectural effort may be advantageous commercially by attracting attention.'

Decoration of the amount preferred by Ruskin or Fergusson also became relatively cheap. For a while after the 1844 MBA it appeared as if decoration in London would get more expensive due to a clause which prohibited decorative projections over the pavement line, thus requiring expensive setbacks for the sake of decoration. Interpretations, however, ruled otherwise. By 1864 The Builder was able to comment 'the cost of decoration as is now indulged in is considerable, (but) the great cost of ground makes the percentage come out but small.'

With such changes in the attitudes and economics of decoration, and the development of other stylistic trends, it is not surprising that the Palazzo style after mid-century was no longer an end in itself, but instead either a part of another style or simply a con-

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tainer for decoration. The former approach was evident in John Whichcord's National Safe Deposit Company Building. (5-34) He faced a palazzo front to each of the main streets on which his building faced, but joined them with slightly recessed, French inspired corner compositions. The container for decoration concept was more common. Edward I'Anson applied 'striking peculiarities' in the form of continuous pilasters and Venetian openings to the British and Foreign Bible Society in 1866. (5-35) The design was the winner of a limited competition assessed by T. L. Donaldson. Gibson's 1875 design for the City Bank in Exeter followed a similar approach. 53 C. O. Parnell applied florid French inspired garlands in a much admired design 54 for the London and County Bank in the City. (5-36) A bank in Bury by Blackwell, Son and Booth was positively French but still a strong palazzo. 55 An 1864 design by Piper and Goodchild was more literally a container. The office of the North British and Mercantile Insurance Co. featured palazzo angles and piers just large enough to maintain the continuity of the facade, with deeply recessed Venetian and Palladian windows within. (2-46)

In these examples the palazzo concept was stretched almost beyond reason, but it had to be in order to compete for favour with the higher Renaissance Italian that began to emerge about mid-century.

The Italian Style

Throughout the mid-Victorian years the journals simply referred to the style of numerous office buildings as 'Italian' or 'Italian Freely Treated.' It was a catch-all term; considering the efforts at novelty and effect, its lack of precision was most appropriate. But it was often misapplied in examples that were more French Renaissance inspired or simply eclectic. One critic charged 'it would be more correct to say that they are not of Gothic design.' 56 In a
great number of buildings, however, the term 'Italian' was certainly descriptive.

Just when the Palazzo was emerging as the major style in office architecture, the leading architects began to turn away from it. Sydney Smirke upstaged Barry's earlier club designs in his 1846 competition design for the Carlton Club, an updated version of Sansovino's Library of St. Marks. The Builder followed over the next several years with suggestions for street architecture drawn from the Renaissance. The style offered features that had been lost in the earlier passage from Classical to Palazzo: styalr wall treatments with entablatures at the floor lines and balustrades above the cornice. Additionally, however, wall surfaces were very plastic, and comfortably held elaborate decoration. Window openings could be trabeated, arced or even arcaded and, most important for offices, could be easily made larger than allowed by either the Classical or the Palazzo styles.

The Carlton Club was not completed until 1856. The Government Offices competition in 1857 signalled the Battle of Styles. Shortly thereafter Italian began to appear on offices across the country. Among the first, and most literally based on Smirke's work, was Gingell and Lysaght's elaborate West of England and South Wales Bank in Bristol. (5-37) For all of its decoration the design was well controlled. Allegorical putti depicting banking practices covered virtually every surface that was not a support or an opening. Gingell followed this over the next twelve years with several designs equally as remarkable for their overall decoration. Of these the Leeds and Yorkshire Assurance Co. building was the most striking. (5-38) A hesitant palazzo outline was covered with a generous array of Palladian windows, iron balconies, broken cornices, balustrades and urns.
David Rhind's Life Association of Scotland offices on Princes Street in Edinburgh, contemporary with Gingell's first work, could match it in exuberance and control. (5-39) Rhind employed an order over each of his three very lofty floors, and provided supplementary lighting by attic-like openings in each of the three entablatures. In the City P. C. Hardwick opened up Barclay and Bevan's Bank on Lombard about as far as the Venetian formula would allow. (5-40) Coupled columns and full height rustication were employed to add stability to the otherwise fragile design. T. C. Clarke departed from the more common storey by storey treatment of floors in his Royal Bank of Scotland with an Ionic arcade supporting a second floor balustrade. (2-37) Less true to the models, but showing a typical amount of exuberance for the period was John Hahn's Mutual Life Assurance Society Office. An immediate neighbour to Hopper's earlier Classical Atlas, Hahn employed a similar range of pilasters, but sought a more visible show through elaborate figure work. (5-41)

All of these buildings were for established joint stock banks or insurance offices. By the later 1850's offices to let began to appear in increasing numbers; the Italian was particularly well suited to their needs. W. T. Randall employed it on a somewhat carelessly thrown together facade for his Mark Lane Chambers in 1857. (5-42) One contemporary noted it was one of the 'studied, carefully cut up, divided and subdivided styles of Italian architecture, as practised in this day.'59 I'Anson's Colonial Chambers was almost a cartoon diagram of the salient features of a Venetian arcade. (2-25) One of the more visible speculative offices in the City, with fronts on both Bishopsgate and Old Broad, was the giant Palmerston Buildings. (2-60) The owners thought the facades were 'imposing frontages,'60 but the Building News preferred to call them simply 'large
As in many other City buildings, polished granite was employed extensively for the Palmerston fronts. The smoke nuisance was so bad that decoration in any other material was said to disappear in less than a decade.

In Liverpool one of the more prolific practitioners of the Italian was J. A. Picton. His York Buildings were noted as a Palazzo design in need of control; his Italian efforts were little better. C. H. Reilly thought Picton 'a better chairman of a building committee than an architect on his own accord,' but his contribution to Liverpool's streets alone justifies an appraisal. The Brown's Buildings supports Reilly's observation. Picton employed five types of windows, three types of arcuated heads, three variations of rustication, solid and balustraded rails, atlantes and sculpted figures on pedestals unrelated to anything below. His Richmond Building and Hargreaves Building were much finer. Immediately across the street from each other on Chapel, both employed Venetian arcading within fairly substantial walls. The Richmond facade progressed vertically from a range of five openings, to nine in an alternating rhythm, to nine in a regular pattern. The Hargreaves block was more regular, with a five, five, nine pattern to the openings, and a full arcade on the top floor.

Picton's major themes were based on window groupings, a focus to which the Italian Venetian particularly lent itself. The examples already mentioned were reasonably pure applications. There was a considerable number of others, however. The Venetian window often appeared in outrageous numbers, as in the City offices for the Royal by the Belchers (2-38) (2-39) and in a speculative block on Cornhill by Edmund Woodthorpe. Lucy and Littler employed them more sparingly, but in a greater variety of positions, in their
In other examples they were more of a punctuation, or, more crudely, simply to add variety from floor to floor. Two buildings side by side on Poultry, in the City, by Hardwick and Cole were of the latter case.

The examples just cited outline the range of the Italian style in offices. Its flexibility and, undoubtedly, its associations, made it the most popular office building style through the mid-Victorian years. Even after that, it never really quite disappeared, for after 1880 its primary devices, the stylar motifs, emphasised openings, repeated orders, and floor by floor entablatures, were subtly integrated into the then developing Free Classic style.

The Gothic Style

The development of a modern Gothic theory and practice, particularly the fervor which characterised its advocates, was arguably the most remarkable aspect of mid-Victorian architecture. But surprisingly, its use in offices was erratic and limited. The Gothic style had developed in the 1830's and 1840's through the emotional and logical reasoning of Pugin and Ruskin and the forceful efforts of the Ecclesiological Society, but it wasn't until the 1850's, through the persuasions of practitioners such as Scott and Street, that it became acceptable for general secular use.

Street in 1853 spoke of the need to adapt the Gothic arcade to street architecture if the style was to grow and reach general acceptance. Scott, arguing this developmental line in his *Secular and Domestic Architecture*, identified the advantages of the style for street architecture. He made an economic comparison that brick was cheaper than stone. He allowed that iron might be acceptable for supports. As gestures to convince the Italian proponents, he claimed that gables were not necessary, but rather were bothersome;
flat lintels, in addition to rounded and pointed arches, were the components of future architecture. Scott went so far as to favour the cornice, emphasising 'the construction upon a Gothic basis of a new palatial style is a task at once truly noble and worthy of the efforts of a great age.' The argument here was for the Gothic in public buildings. Scott lost on the same issues in the Government Offices competition. Palmerston forced Italian on the government buildings, but the competition designs considerably stimulated the acceptance of the Gothic in offices. They provided a much more direct model than all the religious works that had been built before. Probably the first Gothic office building was built in the City for the Crown Life Office between 1855 and 1857. Designed by Deane and Woodward just after they won the Oxford University Museum competition, the building was a visible demonstration of Ruskin's teachings. It featured arcuated openings in various rhythms. Its window area was no greater than the 'hole in the wall' building adjacent, thus allowing a substantial amount of surface for polychrome brick and stone. This was quickly followed by two relatively unknown buildings in Westminster. In 1857 John Taring designed a well-proportioned Gothic front in stone for Low and Company, bankers, in Leicester Square, whilst on Southampton Street Charles Gray designed the rather crude Tavistock Chambers, in polychromed brick.

Among Scott's arguments in favour of the Gothic was that its execution in brick would be cheaper than the stone so mandatory for the Palazzo or Italian styles, and more truthful than the stucco that was often employed as a substitute. The Builder underscored these points, claiming Gray's building was exemplary. The issue was soon a dead one, however, particularly in the City, for by the end of the
decade stucco was hardly used at all. In 1866 The Builder wrote
an obituary for it. Its departure from the building scene was
hastened by the same rising land costs that were making decoration
cheap. Portland stone would have cost the Phoenix in 1838, for
example, an additional £1400 on a £8500 building. By the 1850's,
however, the cost of land had risen so much that an entire build-
ing was cheap compared with the land it was built upon. Stone was
employed on a considerable number of Gothic offices, but brick also
had continued popularity. It was a matter of style primarily, and
only a matter of cost on cheaper City sites or in the provincial
towns.

The Oxford Museum, Scott's earlier Hamburg Town Hall, and sev-
eral of the well publicised entries in the Government Offices com-
petition displayed the major features that were to be commonly em-
ployed in Gothic offices: symmetry, a pronounced cornice, pointed
arches, and arcades. When William Wilkinson, a committed Goth from
Oxford, placed his Crosby House on Bishopsgate in 1861, he displayed
all the essentials of the formula. (5-49) The plan called for a
typical asymmetrical office entry, but Wilkinson disguised this
'flaw' by reflecting his entry arch at the opposite end of the
ground floor. Symmetry was further enhanced by a hesitant gable
which was capped off by a cornice. All of the openings were pointed;
the arcading was only partial. Expressing evolving office needs, the
openings were much larger than in the earlier Crown Office.

Palmerston had objected to the Gothic in the Government Offices
competition partially on the grounds that its pointed arches offered
less light than the square headed Italian, and on this issue he re-
flected conventional wisdom. This liability didn't stop some
architects from continuing with the pointed arch. The problem was
mitigated through the use of arcades which balanced the light over several openings. Waterhouse designed an exceedingly refined arcade scheme for the Manchester office of the Royal in 1862. (5-50) On each of three floors he employed a slightly different arcade treatment. Symmetry was exaggerated and stability enhanced by massive wall sections above each side entry. George Aitchison took this one step further in his building for the City of London Real Property Company on Mark Lane in 1864. (5-51) Here the elegantly detailed round headed arcades had virtually no terminal strengthening; repose was maintained by the overall horizontal character of the opening ranges. Uniform ranges such as these were popular, but few buildings measured up to Aitchison's. One refinement on the approach, however, which added considerably to the repose, was the use of heavy terminal piers. It was employed by City regulars I'Anson in Cornhill, (5-52) and T. C. Clarke on Throgmorton Street. (5-53)

A refinement of the arcade which further attempted to resolve the lighting problem was the use of a solid tympanium behind the pointed arch. This was a common treatment. One of the most skillful examples was by Ponton and Gough in Bristol, 1866. (5-54) For all the light this method produced, it lacked a certain amount of 'truth.' As one critic pointed out, anyone could tell that such construction really concealed the true line of the floor, hidden directly behind the arches. 71

The arcade became a staple of Gothic offices particularly in the 1870's. It was employed for the ground floor only, or as a series of ranges stacked on several floors. It seems never, however, to have been used as Street first suggested it, encompassing several floors.

A square headed arcade solved the lighting and 'truth' problems,
but placed severe limitations on the size of each opening if it was
to be constructional. Waterhouse employed it for a small bank in
Leighton Buzzard in 1866 (5-55) with alternating detached columns
and piers. His office on Lincoln's Inn Fields, with a further de-
velopment of the approach, was a sophisticated essay on the issue.
(5-56) The largest openings at the ground employed round heads,
whilst the first floor openings employed an effective technique of
corbelling the jamb at the lintel without diminishing the window
size. The second floor utilised slightly corbelled and arched
openings; at the third, a change in the rhythm of the openings al-
lowed a minor arcade with pronounced joints at the centre of each
head, proclaiming constructive correctness. The effect was one of
considerable dignity.

Whilst the Gothic style had the most ardent of supporters in
the architectural world, its appropriateness for business purposes
always remained in question. It offered none of the associations
with successful Lombardian merchants that the Palazzo or Italian did.
The Building News in 1862 thought the Gothic 'incongruous' with
business.

The quaintness and homliness of medieval life...has so
utterly vanished from our commerce...the architectural
forms to which it gave rise seem painfully out of place;
...the angular jambs, and square-headed windows, and
symmetrical arrangements of features peculiar to Ital-
ian and Anglo-Greek buildings, (are) more consonant
with the tastes acquired by our tradesmen and merchants
than the pretty irregularities, the rich and varied
features, and the graceful forms of Gothic architecture. 72

A decade later at the RIBA Samuel Knight expressed 'shock at seeing
dressing-bags and hosiery enshrined in windows having the foliated
framework of a chancel screen,' and at the 'beautiful geometric
windows on the upper floor, recalling to memory the Pointed arcade
of some cathedral clearstory, disfigured by business announcements
in letters bold as brass, and ranging from 'accidental death' to livelier subjects. 73

These criticisms notwithstanding, the Gothic spirit prevailed throughout England. In the City, its effect was noticeable although it was never as strong as in the provincial cities and smaller towns. City Gothic came in a range of variants. Deane repeated the Ruskinian Gothic of the Crown Life on the company's replacement building on Fleet Street. 74 The building captured the essence of the original, but expressed its mid-60's date by the windows which approached arcades in their spacing. It featured a blind arcade at the top and a Ruskin inspired irregular window placement on the side, including one opening that went through four storeys. A literal Venetian Gothic design was G. Somers Clarke's General Credit Co. (5-57) Fred Jameson produced an elegant Norman Gothic design for some Cannon Street offices in 1866, (5-58) and R. L. Romieu designed the well-known French Gothic Worcester House on Eastcheap. (5-59) Designed with exaggerated depth and employing detached shafts and pronounced hoods, it was proclaimed by the Architect to be the 'fastest' Gothic to be found anywhere. 75 The Building News simply lamented that the client had so much money and Romieu so little moderation. 76 Another French version, employing more of Scott's principles and displaying the arcade as fully as was possible was J. F. Ward's Albert Buildings on Queen Victoria Street. 77 Down the street was another variant. The Belchers drove a 'massive Gothic wedge...into the very heart of the City' 78 with their Mansion House Buildings of 1871. (5-60) The design relied heavily on pointed arches, but did everything else possible to give its Pointed style a horizontal emphasis. Nondescript Gothic was employed by Edwin A. B. Crockett on the St. Michael's buildings in 1873. 79
All of these buildings, and virtually all other Gothic offices in the City, were for insurance companies or for offices to let. The City was remarkable for its resistance to the use of Gothic for banks. It was hard to associate banking with the Middle Ages. Punch took note of John Taring's Gothic bank at Leicester Square and thought it was a case of mistaken identity. The Builder concurred:

No one having seen the building, and being asked to guess its appropriation...would think of it as a bank...Such a building...would express its purpose not anywhere in London. We are compelled to say that it is one condition of success that habitual associations should not be treated as non-existent. 80

City bankers and their architects agreed, as evidenced by the consistent use of Italian for bank architecture.

One exception was built in the very centre of the City on Lombard Street, in 1864. It was designed by an outsider, Alfred Waterhouse, for some outsiders, the Scottish firm of Alexander Cunliffe and Co. (5-61) For this location Waterhouse moderated his usual vigorous French Gothic to the point where the building style was almost Romanesque. The main features were round headed arches over piers on the first and second floors. Too broad to be considered an arcade, the piers gained a vertical emphasis by Waterhouse's recessing the spandrels. Only above the heavy cornice, in the dormer gables, and in the restrained, almost flat ornamentation, did the Gothic really show itself.

Banks in the rest of the country showed no such restricted vision. The Gothic became a common style throughout the 60's and 70's in the provinces, but particularly in the smaller towns and in the city of Manchester. Banks here were remarkable for the consistency of their efforts, if not necessarily for the skill they displayed. The London, City and Midland Bank put up a building on King Street that borrowed heavily from Waterhouse's Lombard Street build-
ing. It featured a similar pier and cornice treatment, but was more Mancunian in its aggressive corner, displaying an oriel window and a spired gable. (5-62) Showing a bit of French Gothic, and unusually asymmetrical, was the Manchester and County Bank, also on King Street, built in 1880. (5-63) Designed by the local firm of Mills and Murgatroid, it was more uncompromisingly Gothic than most. The planning of the building was based on the church paradigm: it employed a nave and side aisles. One of the latter was for the customers, the remainder of the space was for clerks. (5-64) The tower contained the stair to the board room on the King Street front, which was marked externally by a gable. Seldom in banks was there such a consistency of style and form. Across the street, however, was another equally remarkable bank. Designed by George Truefitt for the Brooks Bank, (5-65) externally it was French Gothic showing 'much originality of design.'81 Internally, it relied heavily on the teachings of Viollet-le-Duc, employing thin iron columns supporting truncated brick arches. (5-66)

Architects in the Midlands were much less consistent than those in the City in following Scott's prescription for a symmetrical and heavily corniced Gothic. In Manchester, where Waterhouse's Town Hall established a precedent, gabled, aggressive, asymmetrical fronts became common features. Adjacent to the Town Hall on Alfred Square was Pennington and Bridgen's Inland Revenue offices, 1874, (5-67) and G. T. Redmane's later Scottish Widow's Fund in a Scotticised French Gothic. (5-68) The Queen's Assurance, also by Pennington and Bridgen, on a prominent site in the shopping district, was another example.82 Other vigorous, asymmetrical, gabled offices could be found by George Hoskins in Darlington,83 Paul and Ayliffe in Huddersfield, Andrews, Pepper and Son, in Bradford,85 and William

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Doubleday in Birmingham. 86 Most of these were for banks.

The Gothic in Manchester commercial buildings was so widespread that The Builder christened the buildings 'Manchester Goods,' a term which characterised

the love of 'chamfering' in all its most recondite and highly developed forms, the desire for something clever and out of the way, the almost total absence of real taste and refinement in style and detail, combined with a considerable degree of cleverness and originality. 87

A similar trend evident in Manchester and nearby Liverpool was that of employing Gothic decoration on a basically Italian building. The example was probably first set by J. K. Colling in the Albany Buildings. (2-63) It received a sanction when E. R. Robinson took over the Liverpool public offices during construction and introduced Gothic leaves and details. 88 In Manchester the mix was employed by Edward Walters in the Liverpool and London Insurance Company in 1862, 89 by Clegg and Knowles for a block in 1869, (5-69) and later by Magnall and Littlewood in a coarser manner on Market Street. (5-70) In Liverpool Joseph Boult raved of this 'new style' he displayed on the Dod's Buildings, 90 although the Building News panned the design. Union Chambers by David Walker showed an Oriel Chambers influence in its repetitious windows and some Greek in the decoration, but had heavily chamfered piers, griffins at the door, and grotesques in the architrave. (5-71) Corn Exchange Chambers was just Gothic and Italian. Giant rusticated piers established a framework for repetitious bay windows with various Gothic head treatments. (5-72)

Gothic in all of its variations was an important contribution to the collective street scene through the 1860's and 1870's. By the next decade, however, the influence of New Zealand Chambers and the new Free Classic was overwhelming. The Gothic displayed an amazing.
staying power in time if not in number. I'Anson did a little Gothic front on Cornhill in 1888, whilst the next year Aston Webb designed a highly refined and very original Norman Gothic in Austin Friars. (5-73) Waterhouse, so instrumental in contributing to the development of the style, began to move away from it in the early 1880's, but returned to it in 1899 for his final addition to the Prudential Buildings on Holborn. (5-74) He had started building in 1878, so the 1899 Gothic was not surprising. This was almost the last gasp of the Gothic, but there were two quite venturesome designs built well into the twentieth century. Both were banks and, not surprisingly, both were in the Midlands. The first was in Leeds, designed in 1905 by C. B. Bulmer for the Yorkshire Penny Bank. (5-75) It was French Gothic, essentially symmetrical, but with a dominant corner tower. The other, perhaps the last Gothic secular building in Britain, was designed for the Palatine Bank in Manchester by Briggs, Wolstenholme, and Thornely, of Liverpool. (5-76) It had a massiveness appropriate to its Norman detail: the appearance of stability was still appropriate in 1910 for bank architecture.

The French Renaissance Style

For those architects and clients who admired the Gothic but weren't prepared to forego the associative advantages of the Italian, the French Renaissance offered an effective compromise. The British avidly followed the construction of the extensions to the Hotel de Ville and the Louvre through the early 1850's and visited them during the 1855 Paris Exhibition. They brought home the most memorable features of these buildings: the well metred pavilions, the mansard roofs, the use of orders for each floor, and the abundance of rich decoration and sculpture groupings.
George Scott expressed approval of the mansard roof:

A lofty roof rising boldly from behind the parapet, and relieved or not by dormer-windows, will give individuality to our building, and, while not making it discordant with its apparently roofless neighbours, will give it a predominance and dignity as compared with them. 93

He got even more specific: 'the mansard roof is perfectly applicable to our style.' 94 'The magnificent dormer windows so frequent in French buildings form a noble feature in street architecture...' 95 Scott's arguments were intended to broaden the base of Gothic architecture. His attitudes toward the French roofs might have been made as a ploy for Classicist approval, but it cannot be overlooked how remarkably well they complemented his other favourite device, the pronounced cornice.

A direct expression of the intermediary position of the French features was made by Fergusson. He cited modern French design as 'free from any sham or concealment,' and noted

how happily...(they take)...a medium course between the frigid Classicality...and the florid Medievalism...; while it is in every respect suited to the wants of the age, and expressive of its feelings, to which neither of the others (i.e., Gothic or Classic) can make any pretension. 96

But it was in common street architecture that Fergusson claimed the 'French architects have achieved the greatest success, and with the greatest amount of originality.' To further his point he showed illustrations of the French in stylar and astylar, and arcuated, trabeated, and arcaded modes. 97

By the time of Fergusson's support the movement toward the modern French was already in full swing. The most well known examples were probably the Westminster Palace Hotel of 1857 and Grosvenor Hotel of 1860, both in Westminster. Earlier examples, however, were built in the City. Both were office buildings, done in 1855. One was a block of offices to let on Threadneedle Street, (3-1) the
other was the London and Provincial Law Life Office (2-45) on Fleet Street. The architect for both was John Shaw. One of Goodhart-Rendel's 'rogues,' he had already completed a number of equally unusual Elizabethan designs. His appreciation for florid and picturesque compositions found a ready home in the French motifs. The block to let was the more awkward of his two designs. Its unusually regular window pattern was only barely softened by garlands and repeated oeil-de-boef openings. The insurance office was more like the work that was to follow by others, with an order on each floor, iron railings, and considerably varied decoration.

From this start the French Renaissance in office buildings gained continued popularity. It became a staple for the next half century. Hitchcock commented that 'of the more consistently Second Empire commercial work the less said the better.' To a great extent he is correct, for the style seems to have been particularly appreciated by the lower ranks of the profession and was often a convenient excuse for excesses or just poor taste. By 1880 it was noted to be 'the style that from experience is found not only to be the most suitable to the streets of the metropolis, but is also most readily adapted to the wants of the practical businessman.' One of the main assets was the mansard roof's advantage in circumventing the height restrictions of the building act, especially important in Westminster. In the City the roof diminished light infringement in 'Ancient Lights' claims.

French Second Empire designs enjoyed a peak of popularity in the 1880's. After that Francois Ier became favoured as a component of the Queen Anne and other related styles. Second Empire influence did not disappear entirely, however, and some of the better works were designed in the last decade of the century. In practice the
Second Empire came to be applied to office building fronts in a variety of ways. At times its use was comprehensive, at others it was merely an addition to another style. It often suffered compositional trauma, but occasionally acted to pull together an otherwise disorganised facade.

Whole buildings received the French treatment. Horace Jones enthusiastically applied the new style to his Sovereign Life Office on St. James Street in 1857. Instead of the common corner entry he elevated an oeil-de-boeuf window to a place of importance on the first floor. He used the same window around the entry and in relief on a chimney at the corner angle! The total composition was very delicate. W. G. Bartlett's Promoter Office on Fleet a few years later showed that the style could have varied emotional effect: the facade was exceedingly coarse. Polychrome stone and an odd, discordant array of carving accentuated the angular character. The style's ability to allow a dramatic picturesque roofscape even on nondescript facades was aptly demonstrated by Thomas Turner's previously noted Lancaster Insurance Office in Manchester.

In Bristol Bruce Gingell's office for the Liverpool and London Insurance Company bore a striking resemblance in general composition and exuberance of carving to the Pavilion Richelieu at the Louvre. Other full blown but less literal efforts were in London. In the City J. Lewis Holmes flashed a five storey, elaborately carved polished granite facade above his 'hole in the wall' neighbours. In Pall Mall Alexander Peebles produced a similarly elaborate facade for the Life Association of Scotland.

For sheer glut, however, it was difficult to outperform the City Offices Company and their favourite architects, the Francis brothers. On the prominent corner of Lombard and Cornhill they spent
£70,000, a considerable sum, and much of it seems to have gone to the stone carvers. Under their mansard roof the brothers squeezed in cornices, balustrades, sculpted groupings and a variety of window openings with great abandon. (5-82) The Building News thought there was 'nothing to admire, though much to wonder at' but admitted 'the carving is as good as the design is bad.'

The French Renaissance was easily overworked in the direction the Francis brothers enjoyed so much. Its constituent components were such that they could be added to different types of architecture. P. C. Hardwick used florid French inspired garlands to soften his otherwise harsh Classic for the Bank of Australasia. (5-83) The Francis brothers set a French roof atop a palazzo for the National Discount Company. (2-41) They had already stretched the palazzo formula to four floors; the mansard kept it from having to go to five. In Leicester, local architect Joseph Goddard followed Scott's directions and simply placed his mansard atop the canted corner of his otherwise Ruskinian Gothic Leicestershire Banking Company. (5-84)

Similar questionable practices involved the compositional accuracy of wholly French buildings. Nelson and Innes's National Bank on Charing Cross Road was so narrow that it barely contained a single pavilion. (5-85) John Belcher's first Royal Insurance Building on Lombard Street featured terminal pavilions but with no compliance in the roof form, (2-38) whilst Richard Almond's rather crude Palace Chambers of 1878 employed another common approach - that of a pavilion roof but with no pavilion below. (5-86)

One wonders to what extent the roof form, with its ability to negotiate 'Ancient Lights,' and its near sanction by the 'two storeys in the roof' clause of the 1894 LBA, created an evocative argument for the continuance of the style in London. It remained a strong
influence in the City through the First World War. Much of the later work was the more fashionable Neo-Grec French, but as late as 1901 Delissa Joseph still employed Second Empire, as did Davis and Emanuel in the largest block then built in the City, the Salisbury House. (5-87) Comprising a full quadrant of Finsbury Circus, it was a rather dull and ponderous design. At least it employed reasonable central and terminal pavilions. William Flockhart proposed the Second Empire for the entire Kingsway and Aldwych in his highly regarded competition entry of 1900.

The French Renaissance did possess one more unique quality which found special favour in the City in the last two decades of the century. Its predominant features - floor height orders, pavilions, steep roofs - were so memorable that they could exist with very little wall surface. As the pressures for greater window area increased after 1880, architects not wishing to follow the New Zealand Chambers' example could easily keep with the French. Its motifs acted like a glue to tie together and give character to office block compositions that were in essence only piers and floors. The roof was important, for if there was not much 'architecture' in the wall, at least there could be some in the roof. One of the first of such buildings was a set of offices to let by Ford and Hesketh on Cheapside in 1880. (5-88) The facade was crudely executed, but it showed the principles. Columns were no more than window mullions. An occasional two storey pier added additional stability. The rather flat facade was made picturesque by the dormers. The pavilion mansard was actually a giant rooflight. Ford and Hesketh paid no stylistic attention to the corner of their building, but William Wimble showed how effectively one could be handled. His 8 Bucklersbury simply wrapped its entablatures around the corner, which was marked above with a dormer and below by the
entry. (5-89) By far the best of these pier and floor buildings was designed by T. Barnes-Williams on the narrow Copthall Avenue in 1892. (2-94) Here a virtually all-glass wall was framed in Portland stone, complete with quite credible pavilions and oeil-de-boef windows. It appears that lighting conditions were so restrictive that Barnes-Williams couldn't use the mansard all the way across the front; he pared it down to positions just over the pavilions.

For buildings such as these the French Renaissance style showed its flexibility in responding to office needs while still maintaining its integrity. This alone may have accounted for its continued popularity in offices. Not to be discounted, however, was its middle-of-the-road position, safely between the Gothic and the Italian styles.

Two Eclectics

By 1860 the lines of support in the Battle of Styles had hardened and the major trends of the ensuing years were set. The Builder commented,

It is remarkable that the spectators of the great fight have not awaited the result. They have gone to their homes, and, in their private capacity of peaceable citizens, have...facilitated...building...unbiased by any opinions but their own.105

For office building architects this was especially true. The issues in offices were generally more related to expediency and effect than to philosophy. I'Anson, for example, practiced in both the Gothic and Italian styles; Romieu employed a French Renaissance as vociferous as his Gothic; the Belchers embraced both as well. To interchange styles indiscriminately was to take no position, and make no contribution to the development of a modern style. This problem was a concern to theorists such as Ruskin and Scott, and preoccupied those less philosophical as well. Charting a stylistic course which was neither
Gothic nor Italian nor French, but fully eclectic, was difficult in an age wholly dependent upon historic precedent. To do it with character and skill, without creating buildings that were mere catalogues of styles, proved to be an elusive task for most, and especially so for office building architects.

Robert Kerr had earlier labeled this thoroughly 'modern' approach 'latitudinarianism.' It was Kerr who produced what was probably the best latitudinarian effort seen in office buildings. The building was for the National Provident Institution (5-90) on Gracechurch Street in 1862. The Provident building earned the admiration of the press, but had few followers. It was an effort of considerable skill in combining disparate parts, although it was not entirely without stylistic references. Its strongest basis was Italian Renaissance, but Kerr loaded it with Greek detail from bottom to top, Gothic faces and flowers in the cornice, an horlage above the entry and a considerable number of urns. In overall feeling it was probably closest to the French Renaissance, due to the horlage, the gusto of the decoration and the telltale feature of the mansard roof, but the effect was remarkably balanced just the same.

While Kerr's sources showed a bit, it was the total composition that gave the building its success. Buildings of this genre were often less skillful or markedly less clear in their intentions. One architect must be noted for the clarity of his objectives, if not the skill in executing them. He was William Sharp Ogden from Manchester. His contribution lies in a book he produced, *Mercantile Architecture*. It could be remembered in the history of office architecture as the only book of the nineteenth century written especially on office design. The designs he proposed were too emphathetic of commercial needs and too extreme to gain general acceptance. It is
difficult to trace his influence in Manchester or elsewhere. His only known work seems to be a modest little Free Classic design on Deansgate at Peter Street in Manchester. This is unfortunate, for the designs in his publication showed the most exciting and violent form of eclecticism. The designs were 'eclectic in character' he stated in the preface to his 1876 work, 'the author preferring to select and combine features of beauty or utility from any available source, all picturesqueness of grouping or detail save that springing from accident and natural requirements being avoided.' Ogden designed for shops and warehouses as well as offices. All of these designs were produced with the greatest attention to natural lighting requirements. They all defy categorisation; they were free explorations in arches and arcs, pedimented entablatures, and liberal ornamentation. He employed mansard roofs while creating Greek or even Egyptian fronts. Other designs showed no such specific directions; they were simply unique. It is unfortunate for history, as well as for Manchester, that few if any of these designs were ever built.

Queen Anne and the Free Classic Styles

By the time Ogden first published in 1876 the search for an Eclectic style had generally been surpassed by explorations in the Queen Anne. The style had been simmering since the mid-sixties in the work of Eden Nesfield, but was 'brought public' by Norman Shaw in several London buildings. The most provocative was New Zealand Chambers, built in the centre of the City shipping district in 1873. Shaw defied City commercial conventions by employing old English and Elizabethan motifs. The building affronted City standards with its bay windows, small lights, and intentionally asymmetrical entry. Most importantly, it had 'sweetness and light,'
characteristics which offices were not supposed to claim, and which must have been as threatening as its stylistic references. The building's publication in The Builder provoked T. L. Donaldson into a tirade no doubt expressive of the feelings of the establishment. He was 'taken aback' to see Shaw, a 'man of acknowledged talent... rake up a type of the very lowest state of corrupt erection... of a period that marks the senility of decaying taste.' With twenty years of hindsight Robert Kerr later reflected it seemed to be... (an) experiment of the most inappropriate kind in the most inappropriate place possible... leaping at one bound to the uttermost limit of probable endurance, planting defiantly in (a street) redolent of nothing in the world but the keenest economics, positively an old fashioned Dutchman's warehouse, a sort of Rip Van Winkle of mercantile establishments, in which no one would expect from the look of it that the simplest transaction of the counting-house could be accomplished in less than a week. Kerr was speaking from the midst of a Dutch revival, but New Zealand Chambers was more English than many of the works that were to come after it. For Shaw it was a mature and highly original work, but for office design it was a continuation of a minor tradition of Early Renaissance works that had occasionally been seen since the early Victorian years. The Staples Inn Chambers, (2-6) mentioned earlier for aspects of its planning, was a deliberate Elizabethan effort. This was near the Temple; others built nearby showed similar sentiment. John Shaw produced a Jacobean design for the Law Life Office in 1834, whilst William Penfold did the same for the Law Union in 1857.

These were, however, mere explorations in historic styles. New Zealand Chambers was a creative inspiration for a new one. The response in office building design was almost immediate. Fred Chancellor, a City architect of some ability, employed the Queen Anne

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style for a branch bank in Kent in 1874. He compromised Shaw's oriel and leaded sash with plate glass on the ground floor and wood framed lights above in slightly projected bays. (5-93) The Belchers used the formula on their Queen Anne Chambers on Poultry and resolved the lighting dilemma in a way that was to become very popular in office design. (5-94) The top sash was leaded, but the bottom of each opening was a giant sheet of plate glass. This building curiously employed a feature that Shaw was restricted from using by the district surveyor: bay windows projected over the building line.\footnote{111}

Others took up the formula, but displayed neither the 'sweetness' nor 'light' of Shaw's work. The Southwark branch of the Central Bank had Queen Anne dormers on top of Gothic and Venetian floors in brick and stone. (5-95) E. Bassett Keeling pared the style down to simple brick openings and humble string courses for the Jerusalem Coffee House and Chambers. The Builder supposed such a somber composition might be appropriate for stern businessmen.\footnote{112} Keeling was an architect of talent somewhat out of the mainstream. His design gained quality through its proportions that made up for its lack of decoration.

In the more anonymous commercial streets of the City were some ponderous Queen Anne designs, done by less skilled architects. Several of the worst appeared just before 1880. Alexander Peebles produced a dull pier and floor affair on Watling Street, and a slightly more cheerful one on Rood Lane. (5-96) Another Queen Anne Chambers, this time by W. Steckham Witherington, was 'Queen Anne,' except for its brickwork, only on the top floors. (5-97) Its sparseness below was accentuated by bald plate glass. Perhaps the most ponderous of all was a block on Aldersgate that had no name. (5-98) The architect, George Vickery, seems to have had a hard time deciding if he wanted
the Queen Anne or the Second Empire.

Most of these examples were offices to let. Banks embraced the style too, but only in the provinces and in Westminster. In the City they were resistant to the style through the 1870's. When the Queen Anne made its first and only bank appearance, it provoked a response almost equal to that of New Zealand Chambers. The architect again was Norman Shaw; the bank was for the Baring Brothers. (5-99) It is significant that this only venture of the Queen Anne in the City for a bank was for a private firm, not for a joint stock company. Red gauged brick and dormered windows read as a sign of domesticity that was entirely comfortable with the personality and services of private banking. It was anathema to the joint stocks, which presented themselves in the City as veritable public buildings. When Shaw's bank was built it prompted a flurry of letters in the Buildings News, initiated by William Woodward, an established City architect and surveyor. Woodward opened his letter with 'What is architecture? I know what it was, but I am afraid that the term is now capable of another definition.' Citing 'ignorant patrons' and 'borrowed...features of a bygone style...so distorted and misapplied...that the effect is one of unmitigated ugliness,' Woodward praised the National Provincial Bank and Crosby House as 'true' architecture. Another correspondent regretted that the Baring's hadn't enough money to have a proper job done. The design was a minor event in the development of the Queen Anne. Its simple ranges of seven windows were highlighted only by two ground floor arched openings, one to the bank and another to a lane, and three dormers. Except for its location on Bishopsgate and its affront to City banking senses, it would have been overlooked.

The Queen Anne has recently been called an 'architectural cock-
tail' with a 'little genuine Queen Anne in it, a little Dutch, a little Flemish, a squeeze of Robert Adam, a generous dash of Wren, and a touch of Francois Ier. Contemporaries of Shaw variously referred to it and its variations as Free Classic, Italianised Gothic, Free Renaissance, Eclectic, or Early Renaissance. Whilst Shaw designed the most visible early works, J. J. Stevenson became the style's most vocal apologist. Through lectures at the RIBA and elsewhere in the 1870's, and in his popular book *House Architecture*, he vigorously promoted what he preferred to call Free Classic. In 1878 Stevenson also brought the style to the core of the City in a thoroughly respectable way. The offices for Anderson, Anderson and Co., shipbrokers, on Fenchurch Street, contained several of the features critical to the general acceptance of the Free Classic in the City. It had an order and a cornice for each floor, a tower at the corner, and a facing of Portland stone. Much more than the formula offered by New Zealand Chambers, this became the standard for City offices, including a few banks, for the next twenty years.

Stevenson's preference for the name Free Classic was significant, for the design took a mid-way position between Shaw's work and the form of Italian commonly practiced in the City. Within a framework of piers were entablatures at each floor, prominent chimneys and a corner tower. Established City architects, such as Edwin A. B. Crockett and T. C. Clarke, employed the parti in offices for the City of London Real Property Company and the London and Lancashire Insurance Office, respectively. Others relatively unknown, such as Karslake and Mortimer, and F. Adams Smith, employed it as well. Crockett relied on a two storey order, another common variant, and both he and Smith included the de-rigeur corner tower. Alfred Waterhouse was quick to note the Free Classic was capable
of accepting almost any device as a constituent element. 'Style is the thing, not styles,' he observed in 1883. The new found freedom could be quite liberating in the hands of a skillful architect, but when attempted by the average office building practitioner, it could be unabashedly awful, quite deserving of Kerr's 'bric-a-brac' label reserved for the 'superficial, meretricious, and shallow' varieties of the style. There was an abundance of office candidates that qualified for the 'bric-a-brac' title in the last two decades of the century. Works by established City architects T. H. Smith (5-102) and Davis and Emanuel were superficial; one by Edward Hughes in Huddersfield was certainly meretricious; (5-103) a Leeds bank by J. P. Kay represented the shallow varieties.

It took a higher level of architect to succeed when there were no more fixed rules. By now a larger number of skillful designers, some of whom were in the inner constellation of the theoretical development of the style, were turning their hands to office work. Halsey Ricardo designed a small front on Great George Street in Westminster that was as unique a Queen Anne design as New Zealand Chambers. It had the same freshness and originality, but at the surprisingly late date of 1888. (5-104) In the City Basil Champneys designed the very narrow Swan Chambers a few years later. Only a poorly resolved first floor entablature blemished a front otherwise quite graceful for such little extent. (2-93) Nearby Aston Webb and Ingress Bell designed the Metropolitan Life Office (2-96) in what was described as 'Gothic Spanish with mixed Italian details.'

Other quality designs were produced by T. C. Collcut, an architect whose reputation grew considerably in the 1890's. His first and more exuberant design was for the City Bank. (2-83) It was the first bank in the City since Baring's, ten years earlier, that did
not employ the principles implicit in Stevenson's Anderson, Anderson and Co. building. It relied instead on skillfully modelled wall surfaces of brick and terra cotta. Another quality Collcutt design was an addition to Henry Clutton's earlier P. and O. Steam Navigation Company building on Leadenhall. In deference to the ponderous Italian original, Collcutt's work was a quiet palazzo-like affair in Portland and Corsehill stone. (5-105)

One of the earliest of J. J. Stevenson's papers on the new style had provoked a response of 'interest and dread' from Alfred Waterhouse. He protested

after having ransacked the world for Gothic detail, and studied Gothic under every form, (this) was just the time to go with it, not to give it up. The difficulty of the Gothic window had been got over in the main, by placing the wooden window-frame behind the arch instead of following it; and Gothic had been shown to be capable of meeting our practical wants. It would be a great pity if we should throw it all over now. 123

Waterhouse continued in the Gothic for the Prudential at Holborn, as has been mentioned, but this was an exception. Within six years of his appeal, he was beginning to be won over. He never completely embraced all the ideals or the various inflections of the Free Classic, but he did transform his work sufficiently for it to be definitely not Gothic.

As has been noted, the Holborn office was a Gothic anomaly for the period as well as for Waterhouse. The composition of other Prudentials generally consisted of a light grid of unembellished Elizabethan square headed windows, surrounded by a grid of thin vertical lines (they really could not be called piers) and horizontal string courses, slightly suggestive of entablatures. Smith has analysed the repetitive and factory-produced character of Waterhouse's ornamentation. 124 What little carved decorative work there was below
the cornice was generally limited to an area around the entry. If the building was on a corner, the entry was invariably at the corner angle.

From its first building in the City (by R. L. Romieu), (5-106) the Prudential Assurance Co. seems to have had economy as a primary concern. Waterhouse's red brick and terra cotta efforts must have pleased the directors. Only in Edinburgh did Waterhouse depart from the red formula; the city fathers objected to such a presence on St. Andrew's Square and the building was built with a local stone. The Waterhouse designs showed the greatest variations above their modest cornices. In Bradford he connected the two diagonal corner gables, and some intermediate ones, with a flying arcade. (5-107) In Liverpool siamesed corner gables capped the diagonal corner oriel, whilst at the other end, a tower marking the termination of the street was enclosed by a Francois Ier roof with chimney pots atop instead of cresting. (5-108)

Waterhouse's design for Nottingham featured a commanding tower placed above the rounded corner entry. Despite the material selection of red brick, terra cotta, and stone, the tower was heavily Perpendicular; the ornamentation connecting it to the entry was Early Renaissance. Another local reference was made in Glasgow, where a Scottish gable capped the diagonal corner. (5-109) Unusual shell ornamentation acted to form a transition from the simple corner piers to the turrets above. In Edinburgh the materials were local, but the style was all Waterhouse. It focused on clever geometry in the corner tower, with successively diminishing rotated rings. (5-110)

The consistency of these designs was such that the Prudential had a virtual trademark with them through the provinces, where Waterhouse did at least eighteen buildings in the last twenty years of
the century. Much of the Waterhouse mystique was built around this characteristic style, but for other office clients his stylistic range was considerable. The Refuge in Manchester was the most Prudential-like, with the same colours, gridded facade, and concentration of stylistic interest above the modest cornice. (5-111) For the Foster's Bank in Cambridge, he employed an exuberant tower above the entry door and an early English Renaissance facade. The modesty shown here must have been in deference to the nearby University buildings. (5-112) Its stone facing set it well apart from the harsh brick of the Prudential offerings. The Waterhouse buildings which differed the most, however, were the National Provincial Bank on Piccadilly and the William Williams, Brown & Co. Bank in Leeds, both done in 1893. Probably as a continuation of the formula that Gibson had established for the National Provincial, Waterhouse produced a building that featured a regular series of rusticated piers. (5-113) Unlike the Gibson designs, however, they contained no orders, and were capped only by a small string course. Suggestions of an entablature were made in the second floor window heads. Above the main cornice were curved pediments, with pedestals holding a series of urns. For the Leeds bank the effect was different again. The design was symmetrical, and very François Ier. (5-114) A recessed centre section above the ground floor implied pavilions at the corners. These were capped by loggias running above the cornice and finally, metal covered, crested roofs.

In contrast to the innovation and leadership shown in the earlier Gothic work, Waterhouse's productions for offices in his last twenty years were simply respectable design. Except for a bank in York by a Liverpool architect, he seems to have had no direct impact on the office designs of others.
Waterhouse's concentration of interest on the roofscape was characteristic of the time. The conviction in support of a strong cornice had been potent through the 1870's; even New Zealand Chambers had one. However, the influences latent in that building only came into full view after 1880. Architects then discovered the Dutch gable and the picturesque qualities of asymmetrical compositions. In offices both symmetry and cornices had been de-rigueur, whether the style was Gothic or Italian. In the last decades of the century there were no functional changes in offices to warrant either of the new features; they were made purely for compositional reasons. Symmetry and cornices were not entirely abandoned, however. An 1898 design for a private company in Hull, for example, made full use of both. In many cases where symmetry could have been easily achieved, it was deliberately abandoned. One common device was shown by the Leicestershire Banking Company in an 1898 design. Two entries were symmetrically located, but one was exaggerated with columns and a pediment. Twenty years earlier both entries would have been identical. In the City George Sherrin ran up two differently sized gables from an almost uniform range of columns below. (5-115) In Sheffield, Hadfield and Son placed oriel windows in a way that violated the symmetry of the twin gables rising above. (5-117) Heathcote and Rawle took advantage of the site for their Lancashire and Yorkshire Bank, at the termination of King Street in Manchester, by emphasising the left hand pavilion with a tower and dome. (2-99) Another representative example was the Yorkshire Penny Bank in Bradford, where architect James Ledingham employed a tower and a gable with a cornice at one end of the long front, but twin gables rising from the ground floor at the other. (5-118) One of the most extremely irregular designs was the Glasgow Citizen offices by T. L. Watson,
designed in 1889. (5-119) Watson employed symmetrical gables and repeated bays, but disguised the regularity with a dormer, a turret, a clock and an entry porch that did not cover the entry steps. Despite these complications, the design showed considerable control.

The other most characteristic aspect of these 'bric-a-brac' buildings was the uniform surface texturing and small scale that resulted from floor by floor orders and exploration of the decorative potential of gauged brickwork and terra cotta. Collcutt's vertical variety on the City Bank has been noted, but the skill displayed sets his work apart from most others. Even a Waterhouse facade could be more textural than interesting. In a context set by the earlier robust Italian or Classic works, such 'sweetness' could be very fussy indeed. Two extreme examples of this problem were in London. W. E. and F. Brown produced a narrow front on Bishopsgate in 1893 (5-120) which must have looked like a toy compared to its neighbour, the Classically designed Wesleyan Hall. It took four storeys and four orders of the Brown design to equal the height of the Corinthian order immediately next door. Equally small scale was the unusually tall facade of the Birkbeck Bank, designed by T. E. Knightley. (5-121) Knightley showed just how difficult it could be to stretch the floor by floor formula to a full seven storeys. The 1902 date of the building was surprising: the design did not show any lessons from the leading developments then evolving.

In addition to style changes, turn of the century developments featured a larger scale and sometimes a more vertical facade emphasis. The changes were evident around 1895 and, as with the earlier change to Queen Anne and its derivatives, Norman Shaw was a major influence. These developments came into full bloom, however, after the century turned, and will be analysed later.
ARCHITECTURE IN THE CITY

Many of the stylistic developments in the City have already been covered, but the City had some peculiar qualities that placed extra constraints on its architecture and made some of its office buildings unique. Major problems related to the narrow streets and the difficulty of capturing adequate natural lighting caused window sizes to increase, as already noted. However, the response goes well beyond this merely formal expedient; there were stylistic responses as well.

The Italian style had advantages in lighting, but stylistic choice did not completely solve lighting problems. As early as 1858, The Builder noticed that the standard formula for good architecture would not work in the City's narrow lanes and courts. It called for a reduction in the size of cornices, an end to ornamentation at the top of lofty buildings 'cast in the air for the delectation of the crows,' and a style based on the Elizabethan to gain larger windows. In a later edition it called for arcades without architraves in an effort to avoid 'weakness or crowding.' Repeated calls for the omission of decoration at the top of fronts were made throughout the next decade.

Architects apparently had such good budgets that The Builder's call for economy at the top went unheeded. J. J. Cole, however, paid particular attention to the limited viewing angle on the front of his Capel and Company offices in 1854. Here bayleaf garlands, the primary decoration on the otherwise spare front, were placed only on the reveals of the openings. A similar approach of selectively placed ornament was taken by T. T. Smith (5-122) for 74 Cornhill in 1874. At 35 Billiter Street Richard Bell did the same with chamfered piers and lintels, both heavily panelled.
The problem of visual stability had plagued city offices since window sizes began to increase in the mid-Victorian years. A stylistic response was shown by Fred Jameson in his little front on Cannon Street in 1866. (5-58) The choice of the Norman style gave the building a solidity through the simplicity of its details. A more common response for securing stability was Greek inspired. In the City an undercurrent of Greek features and detailing remained constant from the time of the Battle of Styles through the Free Classic. For the precedent-dependent Victorians, no style offered greater stability than the Greek. One of the most extensive Greek designs was W. W. Gwyther's Commercial Banking Company of Sydney, on narrow Birchin Lane in 1887. (2-95) The Builder noted it was 'designed in a Classic style with somewhat of a Greek feeling, in order to give massiveness of character while preserving as much light as was possible under the circumstances.' To a facade with classical proportions distorted by the narrowness of the frontage, Gwyther applied his Greek in the form of a pediment, Ionic pilasters, pedimented dormers, and a variety of acroterions. These latter embellishments also gave a rather Greek feeling to R. L. Romieu's otherwise 'hole in the wall' Prudential Office in 1863. (5-106) Other buildings used Greek bits and pieces. The Cornhill building by T. T. Smith, mentioned earlier for its ground floor decoration, turned to Greek in the upper floors. (5-122) A. H. Kersey used a Greek pediment at the first floor of his offices on New Cross Road, but the ground floor had no style whilst the top was Early Renaissance. P. C. Hardwick used none of the restraint, but all of the characteristic decoration of the Greek, including capitals and half capitals, acanthus leaves, and paterae on a set of offices on Lombard Street in 1866. (5-123)
The Union Bank of Australia on Cornhill by Goymour Cuthbert in the 1880's showed a different, but Greek inspired approach. He sought effective decoration for a flat front. The building was definitely Early Renaissance, but it relied heavily on Greek-like incised mouldings to give relief to its flatness. (5-124) John Norton employed similar decorated flatwork to the Francois Ier facade of the Submarine Telegraph Offices on London Wall in 1880.135

Despite The Builder's urgings, the cornice remained a favourite cap for City offices throughout the century. City architects, however, found a method of maintaining their cornice without blocking the precious light to the street or ground floor spaces. Italian based architecture was the starting point. In most true Renaissance architecture the cornice was projected out well over the wall below. City architects placed entablatures at nearly every floor line, and successively set back the face of the wall progressing upward. By doing this over several floors, the wall face at the top storey was several feet back from that of the ground floor, and the cornice could be magnificently proportioned but still not project over the pavement. This was done by architects from the mid 1870's onward. T. C. Clarke employed the technique for the Royal Bank of Scotland in 1877 in a Venetian Renaissance design. (2-37) W. A. Boulnois used it for the Standard Life offices in the early 1880's with a Classical design, (5-125) and J. Holmes Lewis did the same with his wildly decorated Leadenhall House in 1879. (5-80) The technique was in use as late as the First World War. In addition to the better lighting, it added considerably to the repose of the buildings, and kept them from feeling top heavy in the narrow City streets. Despite these advantages, it was largely a City technique. It seems not to have been used anywhere else in the country.
STREET ARCHITECTURE

Victorian office building design was always subject to the prevailing attitudes towards street architecture. It is perhaps ironic that whilst the Victorians engaged in such a riot of stylistic variation, attitudes towards the relationships between buildings on city streets was reasonably constant and unvaried. Indeed, the consistency of the latter supported the variation in the former.

For street architecture the call was for variety. The Victorians lived in a Georgian legacy of seemingly endless 'hole in the wall' buildings. London streets such as Gower Street and Harley Street were open to the criticisms of G. G. Scott, among others, who denigrated the houses there as 'unidentified slice(s) of an unlimited and uniform range.' The Builder in 1843 criticised the more coherently designed Regent Street, which it said had only enough 'variety, sufficient to prevent insipidity, in the several facades.' Targets also were the new City streets such as Moorgate and King William Street, then filled with uniform stucco fronts. By 1858 The Builder was arguing that the stately varied fronts then rising all over the City were a response to national needs, just as the outdated Regent Street had been in its day. Even as late as 1876 Regent Street continued to be viewed as 'unsuccessful.'

When the British looked to Paris, they liked the architecture, not the street architecture. The Builder called it 'monotonous' and added 'we prefer our own architecture, for we do get occasional choice morsels.' After the first impression of Paris, the streets were 'inexpressibly tiring.' The Building News concurred a few years later, noting 'a unity and comparative monotony prevails which is conducive to a certain general low standard of excellence, but wholly destructive of a higher grade of individual merit.'
hesitatingly' preferred the London method.\textsuperscript{141} Even G. G. Scott, who advocated the unifying cornice, disliked the Rue de Rivoli.\textsuperscript{142} French street architecture was the subject of a discussion at the AA in 1877. At a time when French cities were admired for the controls exercised on building height, there was almost unanimous disdain for the uniformity and lack of variety of Parisian streets. Even Phene Spiers, part of the London establishment but trained in Paris and a committed Francophile, admitted 'in the case of a new building in an old street, the architect should have full license to introduce piquancy into his design.'\textsuperscript{143}

Street architecture attitudes toward business buildings were more extreme. T. C. Clarke noted that in the city 'each building... presents as much unlikeness to its neighbour as the efforts of the designer have seemed to make possible.'\textsuperscript{144} H. H. Statham, editor of The Builder, was more philosophical about the need. At the AA, and later in his 1897 book Modern Architecture, he argued that streets of ordinary dwellings might benefit from uniformity, but business buildings demanded variety. 'If a Bank front occurs amid a row of dwelling-houses, or of ordinary shops, we expect to know which is the Bank from its special appearance.'\textsuperscript{145} In a business street, he argued with a Puginian logic that called for an honest exterior expression of internal uses, 'variety is absolutely essential, or the whole thing becomes a blank and meaningless sham.'\textsuperscript{146}

There were occasional, but faint calls for greater uniformity than was practiced. T. C. Clarke questioned the traditional business sense that called for each building to act as an advertisement. So did Robert Kerr.\textsuperscript{147} City practitioner James Edmeston urged in 1862 that certain main lines of elevations be coordinated.\textsuperscript{148}

In practice such calls were rarely heeded, and in general office
building designers paid little attention to their immediate neighbours. Floor heights varied; string courses overlapped. Cornices competed for effect by misalignment. Whilst much of this lack of coordination could have been due to lack of care, a number of architects were in control of adjacent buildings, and executed them in such a way as to produce the maximum of individual variety and advertisement. Charles Heathcote's previously cited buildings at the top of King Street in Manchester showed little acknowledgment of each other. (2-99) Grayson and Ould's trio of insurance buildings on Castle Street in Liverpool showed a similar intentional disregard. (2-98) Part of this disparity might have been due to the stylistic changes that occurred between the construction dates of these buildings, but several in the City designed concurrently were emphatically varied. E. M. Barry and J. P. St. Aubyn designed two buildings for the Temple almost simultaneously; one was Francois Ier, the other Gothic. 149 Edward I'Anson designed a pair for Cornhill just before his death in 1888: one was Gothic, the other Renaissance. (5-126) R. L. Romieu, known primarily for his vigorous Gothic on Eastcheap, had an opportunity to design adjacent buildings. Both were decidedly Romieu, but one was Gothic, the other French Renaissance. (5-127) G. Somers Clarke's well-known Venetian Gothic General Credit Building was built simultaneously with his adjacent, little known Auction Mart. The latter was Italian Renaissance. 150

With these brash stylistic contrasts, one suspects that the abundance of misaligned floors, string courses, and details was a result of architects' intentional efforts to achieve contrast, and not just ignorance or apathy.

**COMPOSITION**

The position of office buildings on streets and the nonsympa-
thetic stylistic attitudes of the Victorians, particularly those related to visual stability, created a situation which called for the utmost of compositional skills. Even though design was constrained by the circumstances of site width and building height, it was possible for architects to achieve reasonable fronts for their business buildings. The techniques employed pervaded mere questions of style. Some techniques enjoyed considerable popularity although success was never guaranteed, as many of the following examples attest.

The attempts of architects to be as much unlike their neighbours as possible created problems related to the articulation of individual buildings and the termination of projecting decoration at the edges of the fronts. At times the disparity between adjacent buildings was shocking. (5-61) The most serious problems were created by cornices and string courses, which required a return at the sides to be historically accurate. Some architects simply ignored the problem and ran their facade treatments over those of their neighbours, (5-23) (5-37) but many took a more considerate course and designed shallow reveals at the edges of their fronts. They provided shadow lines and a place for the return of decoration. The use of this device dated from the mid-1850's and was perhaps more common than the tact of merely ignoring the problem. Henry Currey and John Shaw, among the first, employed a reveal that must have been several feet wide between their fronts on Threadneedle Street. (3-1)

The technique was used throughout the century. J. MacVicar Anderson's front for the Commercial Union in 1896 was representative. (5-17) In certain cases the reveal was the only element that marked any relationship between buildings: P. C. Hardwick's front for the Jones Loyd and Co. Bank on Lothbury would otherwise have become en-
tangled with Cockerell's statue of Westminster on the adjacent London and Westminster Bank. (5-28) I'Anson's Gothic/Renaissance essay on Cornhill was kept barely in balance by a thin reveal. (5-126)

In certain cases architects extended the idea of the reveal to set their buildings further apart from the neighbours, to modify undesirable proportions, or to account for circumstantial passages. Robert Kerr employed a recessed bay at the edge of his National Provident Institution. (5-90) Lewis Hornblower and Son did the same for their Corn Exchange Chambers in Liverpool, but chose to make this articulated space the entry. (5-72) A bank in Bury featured rounded corners, including one adjacent to its neighbours that increased its stability and isolation from the other street fronts. J. A. Chatwin solved the common City problem of accommodating through passages by recessing the bays above each of the two that crossed the site of the Lloyds Bank on Lombard Street. (5-128) P. C. Hardwick had earlier used a similar technique for the Barclay and Bevan's Bank on the same street. (5-40) One recessed bay covered a passage, the other held the entry to the offices to let above the bank. The effect was enhanced by raising the centre section containing the bank one extra storey. Curiously, Hardwick chose to highlight the off-centre office entry and violate the symmetry with extra rustication and a carved tympanium in the window opening.

Much of Hardwick's City work showed similar curious compositional devices. Barclays, for all the Classicising efforts of the raised centre and recessed ends, had a pier located unclassically in the centre of the composition in addition to the off-centre door. Contemporary critics couldn't help but notice them. Such an obviously 'erroneous' gesture was rarely seen before the Free Classic style made similar things acceptable in the last two decades of the century.
Most architects went to great lengths to avoid awkward relationships. T. Chatfield Clarke wrestled with the problem of an unusually wide passage through the front of his London and Lancashire Office on Cornhill. (5-129) Although giving in to the central pier above, he at least created a symmetrical ground floor and entry. For William Grellier at the Royal Insurance Buildings in Liverpool, (5-24) the problem was simply one of finding a balance between Classical goals and the size and number of windows necessary for adequate lighting. He found a resolution by recessing the terminal bay on his Palazzo design, but, unlike the others cited here, maintained its architectural presence by embellishing it with rustication and triple windows. Hardwick at times produced more coherent fronts than his Barclay's design. For the Lombard Street shop and offices, (5-123) he had to accommodate a shop entry, an office entry, and a passage on the ground floor. He accomplished these with varied emphases, and achieved a symmetrical facade by recessing and minimizing the decoration of the left hand bay.

John Gibson took these measures to an extreme in some of his provincial banks for the National Provincial. In Middlesbrough (5-11) he maintained the temple-like proportions of the two faces by ending his stylar motifs short on the side and finishing the wall with a 'hole in the wall' pattern. In Sunderland (5-130) he employed the recessed bay technique on one side, and, on the other, recessed a range of four bays. At the same time he reduced the decoration, resulting in proportions that were the same for both fronts.

Gibson was attempting to achieve a visual stability by adjusting building proportions in a manner more sympathetic with his Classic motifs. The goal of stability, so integral to nineteenth century style, could be achieved through compositional devices. It was large-
ly an issue of the balance of elements, and was particularly achiev-
able through attention to building edges, or 'angles.'

The constraints and demands on office fronts were such that many
architects had difficulty in achieving proper balance. Edmund Wood-
thorpe's Cornhill Chambers (5-45) displayed little grace but consid-
erable ornamentation in its arcades. Burnell and Legg's flat French-
Italian design of 1879 was equally unreposed, evident primarily in
the joining of window pediments. (5-131) Ewan Christian showed the
difficulty of getting in the required number of Gothic parts. (2-47)
The porch and ground floor windows were squeezed into his narrow front
for the Economic Life Office in 1874. This was exactly the problem,
in contemporary eyes, that haunted Peter Ellis's Oriel Chambers.
(2-69) It wasn't the amount of glass that caused critics to call it
an 'abortion,' but rather the lack of stability and repose that result-
ed from the virtually endless repetition of the same sized 'bubbles.' 153
A similar problem was shared by the Mercantile Bank in Liverpool,
which was said in 1866 to be 'appearing as though made in lengths,
and sawn off to suit' consumers' needs. 154

Frank Baggallay, commenting on this problem at the AA in 1889,
argued 'there is no sort of design more poverty-stricken and con-
temptible, than that which seems to come to no definite conclusion,
and to have no bounds which it might not overstop.' 155 The standard
reveal formed a boundary, but to be visually stable, the composition
had to come to a natural conclusion before the reveal. The most
common solution was to visually strengthen the edges of the front.
French designs did this with their pavilions, and, no matter how com-
pressed or mythical they might be, the device had considerable effect.
Architraved entries at the ends, as in the typical bank plan, could
further add to the stability. A slight broadening of the piers
around terminal openings could be highly effective, as Waterhouse (5-55) and Wilkinson (5-49) showed. Pilasters were used for the same reason by T. C. Clarke. (5-53)

Another common device was the use of quoins. These had been sanctioned as early as 1839 by Leeds, who proclaimed 'they clearly express strength where it is important that it should be indicated, namely, at the angles of the structure, besides which they announce that the design is complete.' Generally restricted in use to Italian designs, quoins quickly became reduced to rusticated piers, and then applied in a great variety of locations. Like the Greek motifs in the City, they seemed to be employed because of the symbolic solidity they offered. Whichcord's use of rusticated pilasters with alternating, vermiculated banding was not unusual. (5-132) Unfortunately they appeared even thinner than the Ionic pilasters in the centre of his Bucklersbury front. A frequent misuse of the motif was shown by the Francis brothers in their Baltic House, built next to New Zealand Chambers in 1888. (5-133) Here rusticated piers were a feature of the second and third storeys, but the Francises did not even bring them to the ground. Instead they were perched precariously on an entablature, above unadorned pilasters.

The general compositional problems of the office front were minor compared to those associated with buildings built with shop fronts. The visual instability of considerable glass areas was a constant problem to the Victorians. Whilst there was considerable truth to Samuel Knight's comment that it was 'useless to think of reforming it,' the shop front did prompt several innovative approaches which attempted to meet both the shopkeepers' need for plate glass fronts and the stylistic need for stability. Many, and perhaps most, architects simply chose to ignore the issue. Those that did
seek resolution created a number of responses to the problem.

In 1853 G. E. Street suggested continuous arcades covering several storeys for shop fronts. In practice arcades were generally restricted to separate ranges for individual floors, as has been noted, or just for ground floor openings. Waterhouse frequently used the latter on his Prudential buildings. A direct response to Street was shown in a two storey arch as early as 1855 by Henry Currey on his Threadneedle front. His strategy was employed by others throughout the century. Initially thought to be particularly effective for narrow fronts, by the 1870's the arch was being criticised for the lateral thrust it placed on adjacent buildings if it was a constructional arch, or as being untruthful if it hid a metal bressummer.

The flat lintel over a shop front was favoured by many because of the light it offered, but its use created the problem of how to gracefully make the transition from the open shop front to the more solid upper floors. A variety of techniques were employed. J. F. Ward's Albert Buildings on Queen Victoria Street used a very deep entablature at the first floor line, giving the impression that the mass of the upper portion of the building was resting on a substantial beam. However visually comfortable this might have been, it was still open to the criticism that an iron beam was hidden behind. A

The figure shows a 'beamed' facade.

more honest solution to the same problem had earlier been developed

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by William Burges for a small warehouse in the City. \footnote{162} An iron girder, decorated with modillions, capped a plate glass front. The idea was picked up by office architects who employed it in several variations. On a Cornhill front I'Anson filled the web of his girder with iron fleurs-de-lis, resembling in pattern the decoration in the terra cotta above. \footnote{163} Bassett Keeling, like I'Anson, set his beam on bearing shoulders and, like Burgess, employed \textit{paterae}. \footnote{164} Waterhouse, for the Prudential in Glasgow, placed the shop signage in skeleton letters within the web, making 'a logical and certainly truthful arrangement'. \footnote{165}

Another approach was to develop a latticed, beam-like head over the plate glass openings. Henry Williams used this on an insurance office in Bristol. \footnote{166} An extension of the idea was seen in Manchester by Heathcote and Rawle. (5-134) The entire first floor became a part of the lattice. Variation in the window plane added to the composition's visual carrying power.

By about 1880 buildings were rising to unprecedented heights. Architects found one method to control the visual difficulties was to fully combine the ground and first floors in one composition. J. J. Cole did this in the Gresham Office on Poultry in 1878. (5-46) Iron at the first floor line further added to the effect. Alexander Peebles did the same a year later on Fleet Street. (5-135) Employing Queen Anne motifs, he raised the shop front to the second floor and
capped it with an entablature and an iron rail. Bay windows set within the carrying piers added to the sense of stability.

These methods worked tolerably well, but they left unresolved the break between the shop front and the upper floors. Their ease of execution, however, probably accounted for their popularity. Another method attempted greater resolution between the upper and ground floors. Termed 'pyramidization' by The Builder in 1866, it achieved stability through the careful sizing and placement of openings, and related decorative effects. The Builder's notice was of a front on Coleman Street by John Collier where 'the effect of a great weight carried on a sheet of glass is almost got rid of.'  

The openings of the lower three storeys were grouped together; iron entablatures and 'judiciously varied' iron supports created a gradual diminution of window size from the ground up. Despite its admirable qualities the technique was seldom used, especially in iron.

There were, however, several examples in brick or stone that were
noteworthy extensions of Collier's idea. I'Anson employed 'pyramidization' on a front in Brighton in 1881. For a front in Pall Mall in the same year, Alexander Peebles attempted it in a manner somewhat similar to the latticed girder techniques. His Life Association of Scotland gracefully transformed from a shop front to a quasi-palazzo in three storeys by way of two entablatures and giant balusters. The effect was aided considerably by the manner in which the entablatures were varied in their connections to the bearing piers. Only the Doric entry porch obscured the clarity of the design. Another 'pyramidized' design was in the collection of outrageous fronts by William Sharpe Ogden. It achieved its effect by progressively increased dimensions to the supports over three storeys. Columns transformed to broad piers which then became the spring points for arches. In this transition the openings were slowly decreased to the degree that, above the arches, they formed a uniform range, acting as an implied entablature for all the stylistic activity below. A more subtle effort was shown by Bassett Keeling on his Telegraph Street offices (5-137), noted earlier. Keeling's window size and number were the same on the first and second floors; but on the third floor the windows were smaller and fewer. Keeling achieved his 'pyramidization' by modifying the apparent size of the openings through brick and stone surrounds and piers. The net effect was a virtual connection between each of the plate glass openings and the considerably smaller triangular pediments at the roof.

The 1882 date of Keeling's effort placed it at the beginning of the gradual increase in office building height. As has been noted, many of the Free Classic offices built in the last two decades of the century employed orders for each floor, stacked upon one another. Often a Northern European inspired gable surmounted the composition.
Whilst the mere stacking of orders accomplished little, the gabled front was a direct response to the compositional problem of increasing building height. In a perceptive article on 'Abrupt Street Architecture' in 1884, the Building News, after first noting 'the requirements of building in large cities have not been very conducive to good architecture,' identified the problem as being the 'suddenly-stopped' appearance of buildings with horizontal emphasis on narrow fronts. What was sought was a 'self-contained' front. They suggested the gable was an effective method of achieving this. It could be further enhanced with piers or bay windows. The Building News' comment was perspicacious for the gable became a favourite motif in the last decades. It was not always employed with success, as Davis and Emanuel's building on Finsbury Pavement (5-138) illustrated, but in the better examples it could be a highly integrated component of a total composition.

In addition to the gable, a vertical emphasis solved the 'suddenly-stopped' problem. There were some reasonably good vertical examples. Robert Edis had already done one when the Building News article was printed. For a front on Fleet Street in 1882, he employed the gable, bay windows, and exaggerated piers which, he said, were given emphasis to compensate for the instability which would have otherwise been created by the enormous window openings, (5-139) A decade later, William Duffield produced a single bay composition with gable, piers, and a bay. The impact was marred only by the visual ineffectiveness of his ground floor supports. H. Huntley Gordon, an architect of reasonable abilities, produced several vertically emphasised, gabled fronts in the 1890's. One on Parliament Street was liberal in its borrowings, but tended toward Francois Ier. (5-140) Piers between windows and at the angles carried the lines from ground
floor arches to gables above. In a building for his own office on Cannon Street, the effect of the gable and outsized bay at the third floor was carried to the ground by angle piers. (5-141)

The most prominent of the gabled, vertically emphasised buildings was Norman Shaw's office on the Back Goree in Liverpool for the White Star Line. (5-142) Here Shaw produced a transitional building. By taking the general motifs of his earlier Scotland Yard, including the corner turrets and the gables, he was able to establish a verticallity appropriate to the building's overall proportions. But the heavily rusticated basement openings gave a forewarning of what was to come from Shaw and others.

CONCLUSION

Sixty years of Victorian office design had rebuilt the City of London and much of the centres of provincial cities. Designed within unsympathetic theories and legal and functional constraints, the office building formed much of the character of the growing British city. Impolite participants in street architecture, Victorian offices were robust, showy, and competitive. Dozens of ordinary buildings counterbalanced the occasional efforts of design genius.

The first few years of the new century brought changes in style, theory, and attitude toward office buildings. So quick and universal were the changes that, by 1905, buildings only ten years old seemed hopelessly out of date. The changes were not limited just to style. The office building was also virtually redefined in form, structure, and services in the next several decades.
PART II

EARLY TWENTIETH CENTURY OFFICE BUILDINGS
EVOLUTION OF BUILDING FORM

1840 1850 1860 1870 1880 1890 1900 1910 1920

DEVELOPMENTS

Early Vict Transition Years
Mid Vict. Formal Rationalisation Late Vict. Growing Pains Early Twentieth Century

Offices in borrowed forms
London & Westminster Bank

Early Victorian

Mid Victorian

Late Victorian

Early Twentieth Century

INFLUENCES ON BUILDING FORM

Gilbert Bank Office Theory

Gilbert Bank Theory

Rise in land costs

'Architectural Lights'

1894 LHA

Lifts rise

Attitudes about high buildings and health

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CHAPTER 6

EARLY TWENTIETH CENTURY FORM:

MODERN BUILDINGS FOR MODERN IDEAS

The form of an advanced early twentieth century office building was markedly different from its predecessor of only twenty years.

The slow rise in building height characteristic of the Victorian years was followed by a nationwide building boom that produced office buildings of unprecedented size and height. In London the move of businesses from the City to Westminster allowed building unconstrained by 'Ancient Lights.' The limits of the 1894 LBA took control. Even in the City, the availability of larger parcels allowed offices to rise to new heights. Although 'Ancient Lights' still had some effect, provincial cities, particularly Liverpool and Glasgow, gained towering office blocks.

OFFICE PLANNING

Edwardian office building planning differed greatly from Victorian planning. Growth in the size and number of large companies, changes in the functions of offices, and a new awareness of scientific office management provoked major changes. Facilitated by developments in heating and ventilation, and artificial lighting, these changes were further shaped by the first serious attention to style in building planning.

The nature and size of businesses transformed in the early
years of the century. The number of clerks in the country rose from approximately 400,000 in 1891; to 600,000 in 1901; 850,000 in 1911; and 1,300,000 by 1921.\(^1\) In London a similar increase occurred, with a 45% increase in clerical workers occurring from 1891 to 1901, a 39% increase to 1911, and an additional 49% increase up to 1921.\(^2\) During the same period female workers, virtually nonexistent in the 1880's, rose to comprise 42% of clerical staffs.\(^3\)

Part of this increase was due to the growing number of small businesses. The more visible aspect of the increase, however, was in the larger size of businesses due to intensified trade or amalgamation, and larger clerical staffs due to changes in business management.

Vicotrian office size was restricted by the size of businesses and by the nature of the office activities. Information was recorded in ledger books; these ponderous volumes were difficult to move and required considerable desk space. Records were regarded primarily as legal documents, providing rule of thumb guides for business decisions.\(^4\) Clerks were often regarded as necessary, but nonproductive; their roles within an office were often poorly defined. By the Edwardian years major changes in office work were underway. Office management, or 'scientific management,' changed the emphasis in the office from mere record keeping to accounting, overseeing, predicting production needs and market demand, and providing data for business decisions. Office tasks were no longer 'nonproductive,'\(^5\) but instead were recognised as integral components of business.

Corresponding to and hastening these changes were an increase in the publications related to business management, new designs for office furniture, increased utilisation of office machines, and, for the first time since Gilbart's treatise fifty years earlier, critical attention to the office work space.
Publications for business management appeared in number around the turn of the century. Whilst some of these had short lives, their number represented the emergence of new business attitudes. The Counting House and Merchant's Office was inaugurated in 1892. It was followed by Business Life in 1902, which concentrated on American business organisation, and Business Organisation and Management in 1919. One of the earliest and most comprehensive books on management was Office Organisation and Management by Lawrence Dicksee and Herbert Blaine. First published in 1906, with subsequent editions in 1910, 1914, and 1916, the book outlined contemporary attitudes and new patterns of the modern office. Noting the 'commercial invasion of Great Britain by our American cousins,' it argued:

The day has gone past never to return when great commercial undertakings could afford to have their offices conducted on the slow, if steady and reliable, lines of old, and it is now realised that the office is to a business what the main spring is to a watch. 6

Citing German and American methods in 'perfecting' office organisation, it continued:

attention which has been directed within recent years to the importance of office organisation has had the far-reaching effect in increasing the efficiency not merely of office arrangements, but also every branch of business enterprise. 7

Dicksee and Blaine's description of an ideal office became a prescription for the early twentieth century office. For ease of supervision, they suggested one large room for clerks, especially in larger organisations. Separate rooms would be necessary only for the manager and the chief clerk. The latter's office was to be raised above the general office, with glass walls for easy supervision of the clerks. 8 Natural light, proper ventilation and sanitation were stressed. Telephones were to be in a separate room or box to avoid messages 'leaking out.' Typewriters, for acoustical
reasons, were required to have their own isolated room. The general office, whilst one space, was to be subdivided into departments by railings, counters, or low partitions, with books, documents and 'spheres of influence' remaining within each. Visitors, whose presence was felt to be disruptive to an efficient office, were to be contained behind a counter and screen. The diagram for this containment was perhaps the first published diagram on office organisation. (6-1)

Office furniture was to be simple and dust free, co-ordinated with the office supplies and equipment then gaining general use. Desks were no longer to be pigeon-holed roll top, but sloped-top and spindle-legged, with few drawers. Supplies were kept in cupboards, not desks. The traditional ledger system was replaced by loose leaf books and card files. (6-2) The typewriter and telephone gained undisputed importance. They were joined by the mimeograph machine, and in larger offices, pneumatic tubes for delivering documents. The impact of such changes could be dramatic. One writer, W. H. Leffingwell, claimed a 500% increase in clerical effectiveness. 9

Others similarly argued the need for ample light, ventilation, and planning. J. Stephenson's The Modern Office elaborated on the planning relationship between departments and provided a floor plan of an office. (6-3) Articles in Business Organisation and Management extended these points. E. T. C. Jones in 1919 provided an 'ideal plan,' with most office functions, including the typewriters, in one space. 10 Jones located his functions based on noise, access, and task needs for light. (6-4) W. A. Smith in 1920 argued that the ideal office was easy of access, well ventilated, free from noise, and situated to admit the maximum amount of daylight. He discussed the
placement of artificial lighting relative to desk location. 11

By this time, however, the architectural magazines had also
discovered the importance of space planning. Office design, with
particular focus on lighting and heating problems, was covered in
articles in the Architects Journal and The Architect. 12

The large open office space remained the single most important
characteristic of early twentieth century office management tech-
niques. The plan developments noted here were included in the con-
clusive open office plan, presented by H. W. Simpson in his Modern
Office Management of 1933. Simpson distinguished those functions
that need closed space from those that did not, and simply wrapped
the open clerical space with smaller offices and support spaces.

(6-5) Simpson commented

in the plan submitted, an endeavour has been made to
show that any large central office is the most efficient
unit. The more this is broken up into smaller units, the
more supervision and control become necessary, more floor
space is absorbed, communication between individual em-
ployees is more difficult, and possibly proper venti-
lration and lighting are less practicable, while heating
is more costly.13

These changes corresponded with a demand for production in the
office that was formerly reserved for the works. Indeed, the general
decline in the status of office workers and their closer association
with labourers helped provoke unionisation efforts in the early
1900's.14 Arguments for Parliamentary regulation of office condi-
tions were based on the argument that typists were machine workers.15

The trend was summarised by Herbert Casson in his 1924 The Ideal
Office:

In general we have a different view of office work from
that which prevailed in the Victorian days. The old
quiet masculine offices are gone forever. We have been
invaded by girls and by machinery, and there is such a
clatter of tongues and metal parts that it is rather
difficult in these days to know where the works ends
and where the office begins.16

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The impact of these changes on office building form was substantial. The Victorian office building had been organised around several distinctly different types of spaces. Large offices such as banking halls and insurance offices were built only when the office tasks required many clerks in a single space. Unrelated tasks were relegated to separate rooms. Open flexible office spaces had been a hallmark of office buildings since the 1860's, but the rationale was to allow choice in partitioning, not to eliminate partitions altogether. Many offices continued to be built throughout Victoria's reign with bearing partitions or obtrusive chimneys when the size of office space needs could be predicted. (6-6) Whilst offices continued to be built this way up to the war, their numbers did not diminish the evolutionary importance of the open office: it eradicated the major differences in planning between the office to let, and banks and insurance offices.

The new business ideas demanded new building forms, and forward thinking architects were quick to respond. One of the earliest examples of central office planning was already visible in the closing Victorian years. It was the main office in a building designed for Messrs. Reckitt and Sons in Hull, by Gelder and Kitchen in 1898. (6-7) The general office, ninety feet long and almost fifty feet wide, but only thirteen feet high, was surrounded by peripheral rooms, including the typing room.

Perhaps the purest application of the central office idea was the 1901 office for the Norwich Union Life Insurance Society by G. J. and F. W. Skipper. (6-8) (6-9) Undoubtedly an underlying motivation for the scheme was its architectural impressiveness, but the efficiencies of its planning were such that the exact model was still being proposed by Simpson thirty years later. (6-5) In the Norwich
the general office was surrounded by actuarial offices and no fewer than five typing rooms. The general office rose through two storeys, with the peripheral smaller offices on both levels. Similar planning, but without the pretensions, was evident in F. W. Troup's Blackfriar's House (6-10) in the City, and the Wesleyan and General Assurance Society in Birmingham. (6-11) This latter building, designed by Ewen Harper and Brother in 1905, had an open floor area measuring over seventy feet by eighty feet.

The buildings just noted were designed and built for the companies that occupied them. Buildings built to let changed with the same business objectives, but had the additional requirement of tenant flexibility. Evidence of these changes is visible in the general arrangement of the buildings themselves.

The greatest single concentration of new office buildings in Edward's reign was on the new Kingsway and the Aldwych. Called the 'Street(s) of New Ideas,' they filled up with new types of businesses. In contrast to the insurance companies and banks in the City, the Kingsway and Aldwych housed advertising, sales, telegraph, electronic, office equipment and photographic companies. The firm of Trehearne and Norman was responsible for many of these buildings; their work incorporated state of the art ideas. In the decade after 1913 they designed Empire and India Houses, Victory House, Shell Corner, Canada House, and Africa House. The plans were simple and direct. The stairs, lifts, and toilets were placed to leave the office floor space as uninterrupted as possible. Canada House (6-12) and India and Empire Houses (6-13) showed no pretense of subdivision. Their thirty-five feet deep spaces, measured from window wall to window wall, were not excessive, but were accomplished without interrupting columns 'in order to avoid cutting up the completely free and open

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Floors which are now so much in demand by business tenants. The long clear spans required compound steel girders. In later buildings on the Kingsway, Trehearne and Norman maintained the same planning, but allowed the office depth to increase. On Shell Corner they achieved sixty feet by forty feet spaces, whilst at Africa House a forty foot depth was available in spaces up to 170 feet long. On these latter buildings they did not continue with the clear span framing. Perhaps the cost or impact on framing depth, and therefore building height, made clear spans difficult to justify.

These Kingsway buildings were not the period's largest open offices. On adjacent Aldwych Gunton and Gunton designed Aldwych House with sixty feet deep floors, whilst Bush House was sixty-five feet deep. H. P. Monckton's Pearl Assurance Company on High Holborn, 1913, had sixty-four feet deep floors. Adelaide House, on London Bridge, had spaces as far as thirty feet from a window.

None of the buildings cited thus far were in the City. Although there were opportunities for larger and grander City offices, particularly in Moorgate and King William Streets, rebuilding there was still largely constrained by small property sizes and 'Ancient Lights.' Two speculative buildings by City regular H. Chatfield Clarke showed, however, that City office planning changed as well to accommodate the open office. At 17 St. Helen's Place Clarke squeezed the lifts and stairs into a light area and opened up the floor space as much as possible. Forty feet deep, the floors were as wide as many on the Kingsway. In his design for the larger Leathersellers Company building on Bishopsgate, Clarke took advantage of the irregular site. By placing his stairs and lifts in corners, he created large open floors. If either of these buildings had been designed twenty years earlier, they most likely would have had their stairs and lifts...
located in the centres of the floors.

Clarke's designs may have been the most open of contemporary City offices. Many companies, particularly the banks and insurance companies, had little difficulty in taking advantage of open plans. Even though larger sites were becoming available, there were still constraints. A comparison of the Norwich Union Office on Fleet Street (6-20) from 1914 with the home office in Norwich (6-8) is instructive. In contrast to the breadth of the Norwich building, the City plan was squeezed into a site with twelve sides, crossed by a right of way. Whilst this example is extreme, it was not unusual. The Chartered Bank of India, Australia and China, designed by Gordon and Gunton in 1911, had similar shape and right of way problems. (6-21) Their Royal Insurance Building on Lombard Street was wrapped around two sides of the National Bank of Scotland. (6-22) At the Royal the architects placed the core in one leg of the 'L' to leave the other free for open planning. They managed to get clear spans up to forty eight feet wide! Clerks in the open spaces were surrounded by managers in peripheral offices.21

The Royal distributed its functions over eight floors. Like many other City offices, it housed its 'typewriters' on a mezzanine floor. The Phoenix in its 1914 rebuilding went further, subdividing its mezzanine into five rooms for the 'typewriters',22 and served them with pneumatic tubes.23 The separate floor location must have solved several problems. In addition to acoustical isolation, it provided the desired social isolation of keeping the women as far removed as possible from the male clerks.

Office depths of greater than thirty-five feet without top lighting could hardly have been achieved without changes in window area and improved lighting. Additionally these open office areas could
not work without changes in heating and ventilation. City office
buildings had regularly employed large amounts of glass since the
1850's. But for stylistic reasons they were generally limited to
the rear areas, with street fronts more closed, massive and visually
substantial. The twentieth century brought an increased demand for
whole walls of glass, but the majority of office buildings still
retained the front to back distinction. Even Aldwych House and the
Pearl Assurance, with floors more than sixty feet deep, had relative-
ly small street openings. Trehearne and Norman, however, produced
the most venturesome open facades, employing floor to ceiling openings
extending almost wall to wall. Such gestures had enormous stylistic
impact; their analysis will be reserved until later.

The effectiveness of full height windows was related to ceiling
height, but in most buildings ceiling heights were even less than
Victorian standards. Even Trehearne and Norman's long spans were done
with only eleven foot floor to floor heights. The Royal, with forty-
eight feet deep floors, had ten feet, nine inch to thirteen feet; four
inch high upper floors. At Bush House they were twelve to fifteen
feet high. Surely any limitations in natural lighting had to be
compensated by artificial lighting.

The suggestion that offices rely on artificial lighting all day
long would have been heresy only twenty years earlier, but the early
years of the century were so full of change that even this had some
appeal. The new planning ideas were certainly a major factor in the
definition of the twentieth century office, but they accounted for only
a part of the changed whole.

THE CONTINUED GROWTH OF BUILDING SIZE

American developments in office buildings and skyscrapers had
been watched closely by the British since the 1890's. Whilst the architectural press reported American events with regularity, it conveyed a general attitude of disapproval. "Such tall buildings are not wanted in Great Britain," noted The Builder in 1908. Despite this admonition, however, buildings continued to increase in size and height throughout the country. Whilst never reaching the exaggerated proportions of their American counterparts, the net result was that the pre-eminent twentieth century office building was substantially larger than its Victorian predecessor.

The pressures for the new building size included the rapidly growing business demands, the increase in size of joint stock companies, and the continued preference for new space over old.

In Scotland the effects were most evident in Glasgow. The surge in building in Glasgow at the turn of the century resulted in several very large, very tall buildings, many of quite notable architectural quality. Glasgow, like the rest of Scotland, had no 'Ancient Lights.' Additionally, the 1900 Building Regulations allowed 100 feet heights. The effect, by British standards, was virtually no regulation at all.

One of the earliest of the really tall buildings was James Salmon's Mercantile Chambers, 1897. The seven storey height was exaggerated by a top heavy appearance due to balconies and oriel windows that projected further over the pavement the higher they were located. This was topped by John Campbell's Edinburgh Life Assurance Building in 1904. At eight storeys and close to 100 feet, its height became the norm for Edwardian Glasgow. Campbell followed this with the similar commercial block at 84-94 St. Vincent Street. Both of these buildings had flat fronts from pavement to parapet. On the rear, however, Campbell did what could be done only in Scotland. Built to the maximum of their sites, both buildings had shear rear walls, even
though the lanes they faced were as little as eighteen feet wide.

(6-25) The lighting could have been terribly limited, but Campbell opened up the rear elevations with metal framed curtain walls. They have been noted as precursors of modern architecture. 31 In the evolution of offices the glass walls are more important as a tribute to what could be done without the restraints of 'Ancient Lights' and with the controlled warmth of central heat.

Other Glasgow architects produced buildings as tall as Campbell's. John Burnet's Atlantic Chambers (6-26) and Waterloo Chambers (6-27) are both well known. J. H. Craigie created a seven storey building by adding three storeys and two domes to the top of Alexander Thompson's Grosvenor Building. 32 J. M. Dick-Peddie's giant Scottish Provident Institution, also as tall, stretched to an almost 150 foot front. 33 This was the longest of the tall buildings. Lyon Chambers, Salmon and Son and Gillespie's innovative concrete building from 1905, was certainly the narrowest. (6-28) (6-29) Rising to almost 100 feet, its site was only thirty-three feet by forty-six feet. 34

Manchester's building regulations did not have any height limit, but business pressures were not as great as in Glasgow, and really large office buildings were few in number. Charles Heathcote and Son's Lloyds Bank was one of the largest. On King and Cross Streets, it was large enough to front on three streets. The power suggested by the fronts, however, was diminished at the rear, where an 'Ancient Lights' settlement with a neighbouring chapel cropped the floors abruptly. (6-30) (6-31) Even larger, and somehow without apparent 'Ancient Lights' scars, was the Calico Printers' Building, which rose ten storeys above Oxford Street, and ran for most of the block. (6-32)

In Liverpool the concentration of activity was at the pierhead. The government had virtually sanctioned the old George's Dock area
for offices with its Dock Offices Competition in 1900. The Royal Liver was the first private company to follow with their new headquarters building designed by W. Aubury Thomas in 1907. Liverpool, through its trading activities, was the British city most enthusiastic about American skyscrapers. The Royal Liver Friendly Society was American in its thinking. Paying £70,000 for the site, the company considered the purchase high priced, but also

a good stroke of business...now recognized (sic) by competent judges that the splendid courage of the Society in purchasing one of the finest commercial situations in Europe is amply justified...from the point of view of effective advertising.

The Corporation allowed the building to exceed its 100 foot height regulation in 1908. Employing Hennebique's patent concrete, the building covered almost an acre and a half and rose to 170 feet, with towers to 295 feet.

Meanwhile, Thomas was working on his other waterfront giant, the Tower Buildings. Covering three quarters of an acre, the steel framed building was 130 feet tall. The last of Liverpool's monumental waterfront triumverate was the Cunard Building. Designed in 1914 by Mewes and Davis, it covered over two acres in area and rose to 130 feet.

These three buildings were the largest single concentration of tall buildings in Britain before the War. Unfettered by 'Ancient Lights' due to their location, their loftiness rested solely on Corporation approval and a bit of American gusto. Building in London was more complicated.

Nineteenth century office building construction was largely a City affair. Except for the ground floor offices of banks and insurance companies at service locations throughout London, most business transactions were carried on in the City. By 1900 the City was
almost saturated. Built to the limits of 'Ancient Lights,' office construction continued but with difficulties. In Edwardian London, Westminster became the setting for most office construction, as well as the biggest office buildings.

Whole streets were built or rebuilt as leases uniformly terminated. The Kingsway and Aldwych were the most celebrated of the new thoroughfares. Leases were falling in on several Crown Estate streets. Cockspur Street and Pall Mall were largely rebuilt. Whilst Regent Street was primarily a street of shops, its southern end, Waterloo Place, was rebuilt for offices. Giant, almost free-standing offices were built along the Victorian Embankment and Millbank, and near St. James's Park. Just as businesses of related types tended to concentrate on particular streets in the City, so, too, did they in Westminster. As has been noted, the Kingsway and Aldwych attracted the new technology, trading, and advertising companies. Engineers, agents, and surveyors, many displaced by the growth of government offices, found new accommodation around Parliament. Cockspur Street became a street of shipping agents. Large companies desiring advertisement built large, monumental buildings. Among these were the Anglo-American Oil Co. on Queen Anne's Gate, The National Telephone Company on the Embankment, and the British American Tobacco Company on the Millbank. Both Piccadilly and High Holborn gained new insurance offices.

The limited capacity of the City to accommodate the new and increased business demands accounted largely for the almost wholesale rebuilding of Westminster. But beyond this problem, the City had very little light and air, was congested with traffic, and had street noise problems. The expanding underground system additionally al-
owed quick commutation to Westminster from all of London.

Beyond all of these reasons was another: it simply was cheaper for a business to be located in Westminster. Unless a company really had to be in the City for business transactions, there was little economic motivation for locating there. Rental values varied substantially across various parts of London, but the City was the most expensive. For example, first floor space on Threadneedle Street was let for 25s per foot per year in 1911. Comparable space on the Aldwych was only 7s to 10s, whilst on Victoria Street it was even less: 5s6d. The rental for the ground floor of the rebuilt Liverpool, London and Globe Insurance building in 1902, across from the Bank on perhaps the most prominent and expensive site in the City, was set at £2 per foot. This amount was so high that even shops could not afford it 'without disaster to their trade.' In comparison, Aldwych ground floors were let at only 10s to 20s. It is no wonder that the banks and insurance companies became almost the sole occupants of the City.

Westminster office buildings filled out the promise of the 1894 London Building Act. Whilst they varied in types of accommodation and external expression, they were remarkably consistent in height. Eighty feet to the cornice, with two storeys in the roof, became the rule rather than the exception. Such consistency was related to the generous street widths of Westminster, the often simultaneous street rebuilding, and the common requirement of landlords that tenants abandon 'Ancient Lights' claims. Rebuilding in Westminster was not without its problems, however. Sale of lots on Kingsway was slow; one outstanding factor may have been the 'Ancient Lights' claims made by the interests of properties behind the new street. Several buildings showed the scars. Delissa Joseph's 109 Kingsway received a curious stepped, temple-like treatment (6-42) as part of a settlement.
Across the street Trehearne and Norman's Africa House was abruptly truncated at the rear Gate Street side. (6-43)

These flaws of form were relatively minor inconveniences in Westminster. The larger Westminster site sizes and proportions were such that they allowed the most modern open floors. Building in the City was a different situation. While several notable buildings on the edge of the City, such as Blackfriars House (6-10) (6-44) and Adelaide House, (6-17) (6-45) were remarkably like their Westminster counterparts in height and volume, rebuilding continued to be highly constrained.

The pressures to rebuild, however, were tremendous. The high rental values previously cited were a reflection of astronomical land costs. (See Appendix 1) On the streets around the Bank, land was worth as much as the 'skyscraper-provoking' amounts in New York City. The Builder reported in 1910 that New York values ranged from £50 to £164 per foot. In the City the reported range was from £70 to £100.45 George Head, speaking at the Surveyors Institute in 1909, noted City values at £70 per foot.46 These figures concur with those in the Royal Insurance Company's memorandum book, which noted 1-6 Lombard Street being offered at £85 per foot in 1903, and 10/11 Lombard at £83 almost twenty years later.47 Further from the Bank, 80/81 Lombard Street went for £53 per foot as early as 1900.48 In New York the response to such prices was to build up. The £164 price noted above produced a thirty-two storey building. New Yorkers had long preferred offices on higher floors, thus giving additional justification for skyscraping buildings.49

In London the reverse was true. High buildings were almost universally condemned because they blocked light and air, taxed transportation systems, and displayed ungainly proportions. The height
limitations of the 1889 LBA and the 1894 LBA were the regulatory expressions of the first outcry against tall buildings. The journals were quite happy to watch economic height limits being reached in New York. Tall buildings were decried in the RIBA Presidential Addresses by John Belcher in 1904, and Ernest George in 1908. The intolerance continued through 1921, and culminated, at least temporarily, in a series of heated articles and discussions at the RIBA.

These attitudes were reflected in City rentals for various floors. The reduction in value proceeding upward was remarkable. Threadneedle properties rented in 1911 for 30s on the ground floor, 25s on the first, 18s on the second, 15s on the third, and 10s on the fourth. The Phoenix records indicated an even greater variation on their King William Street property. Whilst the ground was worth 30s, the first was only 10s, and the second was 7/6. The Liverpool, London and Globe, which noted earlier had valued its ground floor at £2, believed the first floor to be worth only 15s per foot. This diminution in value upward was similar in other parts of London. Whilst businesses were willing to pay more to be near the Bank, they were never willing to pay as much to be on an upper floor as on a lower floor. These figures suggest that the economic returns diminished as one built taller buildings in the City. In addition there must have been greater difficulty in building taller because 'Ancient Lights' problems increased.

Yet despite these problems a considerable amount of construction occurred in the City. Business demand overwhelmed all other pressures and difficulties. The banks, insurance companies, and speculative office building companies had the resources and staying power to persevere. They notched the City a couple of floors upward with
new, modern offices. (See Appendix 2)

Larger buildings demanded larger sites. Rebuilding in the Victorian years generally required the assembly of several parcels, often laced with passages. The same pattern prevailed in the Edwardian City, but the pressures to build resulted in new building sites that were the antithesis of the simple, regular sites of Westminster and the Provinces. The Cross Keys House was squeezed into a site so irregular that it had more sides than rooms per floor.

(6-46) The problems of the Chartered Bank of India (6-21) and Norwich Union Office (6-20) have been noted. These examples were among the more extreme cases. More reasonable sites were available with the creation of Finsbury Circus, where Salisbury House, designed by Davis and Emanuel, covered 50,000 square feet. (6-47) As King William Street and Moorgate Street ground leases were uniformly falling in, both streets were rebuilt to almost uniform heights. The Northern Assurance building by E. W. Mountford, 1906,59 was at one end of Moorgate, and 43-53 Moorgate, by Richardson and Gill, 1920,60 was at the other; both reached about sixty-five feet to the parapet. 43-53 Moorgate was cut off from greater height by 'Ancient Lights.' The remainder of the street was in the same range. King William Street was rebuilt a little higher. The Phoenix rose to seventy-eight feet, a typical height for the street. This dimension was just two feet short of the LBA limit, but in the City two feet could make a big difference.

The Phoenix Assurance Company had to make a considerable effort to achieve its height. Its efforts are representative of City problems, and are worthy of elaboration. Discussions for the new building started among the managers in January 1913. By July, J. MacVicar Anderson had been selected as the architect. The design was finalised
by January 1914, with the builder, Trollope and Sons and Colls and Sons, selected in April. The site was one the Phoenix had acquired as part of an amalgamation. (6-48) It extended a full block along King William Street, from Abchurch Lane to Sherbourne Lane. The design, at seven storeys high, with two floors in the basement, was among the larger City buildings built at the time. By working overtime, the builder needed only fourteen months for construction. Construction could not start immediately, however, for it took eighteen months to get the 'Ancient Lights' problems resolved.

The list of settlements required was extensive. The owners of the leasehold at 2 Sherbourne Lane were willing to settle by selling their building to the Phoenix for £35,000. It was already so poorly lit that it was hard to keep tenanted. In the end, however, the Phoenix paid £1500 plus costs. The freeholder settled for £100; the subleaseholder wanted an additional £1000. The City Carlton Club agreed that the Phoenix should clean its Sherbourne Lane front at least twice per year.

The London Life Association across King William Street agreed to the Phoenix height of seventy-eight feet if the Phoenix made no claims when it rebuilt to the same height. The owners of 1 King William agreed to the same terms. Essentially the same agreement was made with the Standard Life. H. Chatfield Clarke, the Standard's surveyor, forced the Phoenix to pay £2500 for the right. The Caledonian Insurance Co., across King William Street received £1000 and gained the right to raise their new building to the same height as the Phoenix.

The owners at the Chachan, a pub on Sherbourne Lane, settled by selling their building to the Phoenix, which rebuilt for them a new pub and gained an additional 5000 square feet of office space. Eight
King William Street settled without payment. The Globe House on Sherbourne Lane settled when the Phoenix agreed to pull back its top floor. The leaseholders of 25 Abchurch Lane settled after the Phoenix's fifth floor was pulled back, the side to Abchurch Lane was faced with white tiles, and the Phoenix agreed to pay all costs. The case of 12 Abchurch Lane was settled by arbitration, during which it was agreed to extend the upper floors toward the lane. Anderson had estimated the settlement would be L1000, and was shocked when it was awarded at L7500. The Phoenix accepted because of the extra space gained, and because Bank of Egypt, its prime tenant, was left unaffected.61

There may have been other settlements that failed to get recorded. These thirteen settlements cost over L15,800. More important, however, was the time period required to resolve the problems. In that time the building got larger at the lower floors, smaller at the top.62 Its resemblance to Anderson's original design was probably the result of his decades of experience as a City architect. This was Anderson's last building; he died during its construction.

The shaping of buildings like the Phoenix building through 'Ancient Lights' settlements was the greatest continuity City offices shared with their Victorian predecessors. The new buildings in profile were also remarkably similar. Although the framing might be steel, or the floor to floor heights diminished, or an additional floor or two added, the salient features of the Victorian City profile remained through the war.

M. E. Collins took great care to step the profile and stretch his London and Lancashire Fire Office for every last bit of light, through skylights, oriel-s and raised bulk heads. (6-49) The Builder had 'never been over a building (which was) better lighted
and ventilated in every part. The Salisbury House had fewer floors on its rear side than it did on the front (6-50), in the tradition of I'Anson, Whichcord, and the Francis brothers fifty years earlier. Campbell Jones's Hong Kong and Shanghai Bank (6-51) had narrow floors to allow light into the banking hall, but also had an angled profile, a consequence of 'Ancient Lights.' These examples included the main features of City office buildings of the early twentieth century. Built as large as they could be to meet unprecedented business demands, they were never as large or graceful in profile as their counterparts in Westminster or the provinces.

Whilst City building developments may seem like only minor incremental growth over Victorian achievements, that growth was important because it brought buildings up, just barely, to the limits of the LBA. In Westminster, and in the provinces, building height was a matter of advertisement and business gusto. In the City, height was a matter of survival against fantastic land values. It was achieved through the one common denominator of all City office building design since the mid-nineteenth century: negotiation.

BUILDING PLANS AND STYLE

The major goals of Victorian office building planning were related to gaining adequate light and space for office functions, as well as efficient arrangements on unusually constrained City sites. The pressures of these factors were so great that, except perhaps for an occasional facade, office buildings stylistically were generally of average to low quality. Style rarely was an issue in building planning.

The exceptions to this pattern were the public spaces of the banks and insurance companies, but even here style dictated internal
organisation only to a limited extent. Examples such as Cockerell and Tite's London and Westminster interior of 1838 and John Gibson's National Provincial Bank on Bishopsgate of 1863 stand out as rare gestures. Their successors, however, generally fell short in quality: large office spaces were designed for light and air, respectful of the limitations of site size and shape. Architectural qualities were achieved only with rich materials and elaborate decoration.

Plans for J. MacVicar Anderson's Commercial Union Assurance Company on Cornhill, (6-52) and W. W. Gwyther's Bank of Scotland on Bishopsgate, (6-53) both from 1896, represent the final development of Victorian planning in large offices. Both of these plans showed token efforts toward symmetry and structural regularity. Expediency could be seen in Anderson's off-centre axis and merely functional placement of subsidiary rooms. Gwyther's axis, perpendicular to the street, was violated by the corner entry and by the poorly defined edges of the main space. In both plans, characteristically, the organising ideas were strongest at the centre, but were lost at the edge and in the development of the subsidiary spaces. In neither case were they strong enough (as compared to Gibson's National Provincial) to remain intact with such hedging.

Offices to let were even more disappointing. Economics of planning and arrangements for light took priority over architectural effect. Surprisingly, this held true even in the largest buildings, such as Palmerston House (2-60) and Gresham House. (2-59) Behind their highly decorated exteriors, offices to let offered little more than spare, well-lit, minimally decorated space.

The standard late Victorian approach to offices to let is represented by Finsbury Pavement House by City regulars Davis and Emanuel. (6-54) It was a large building with over 250 separate offices. Its
only innovation was that it was one of the first applications of an American technique that was soon to become standard: multiple lifts placed together instead of dispersed throughout the building. Otherwise the building planning was pure Victorian. In addition to its many fireplaces and fixed office walls, the building had a labyrinth of corridors, allowing each of the rooms to be let separately. The plan shape and internal arrangements responded almost solely to light and space needs. An opportunity to create a proper and generous architectural relationship between the doors and lifts was inherent in the entry hall, but it was not seized. Offices to let had a strong tradition of functional and economic based design to upset if they were to gain internal architectural qualities. Some buildings never did break tradition in plan, as M. E. Collins's Queens House from 1917 showed. (6-55)

The leading office buildings of the Edwardian years were substantially different in their internal planning and character. They had style behind their facades, style that pervaded basic aspects of building planning. The reasons for the dramatic change were twofold. First, the turn of the century brought with it substantial growth in the size of companies. Simultaneous with this was a public acceptance of the important role of business in British life. The preeminent Victorian joint stock companies had been the banks and insurance companies, but by the turn of the century these were joined by shipping companies such as Cunard, communications companies such as Marconi, Eastern Telegraph, and the National Telephone, and manufacturing and trading companies such as Kodak. These companies demanded a public face and public interior. Soon the demand spread. The stylistic lead they established soon was applied to offices to let for smaller companies. The second and equally important factor
was that office building design was no longer left to the office specialists. Leading Edwardian architects began to take on office commissions. Perhaps it was the general cultural acceptance of business that made offices a more acceptable practice for the best architects.

John Belcher, Norman Shaw, John Burnet, Edwin Lutyens, A. E. Richardson, and Beresford Pite all designed offices. What they and others who followed did was to create monumental public interior spaces. In a bank or insurance company this was done more emphatically than the Victorians would have dreamed. In a new joint stock company, or in an office to let, this was done with directness and clarity, even though limited in space.

The first and grandest attempt at monumental office planning was John Belcher's entry in the Royal Insurance Competition of 1896. This design, generally regarded as that of his assistant, Beresford Pite, was so grand a gesture that it hardly worked as offices. (6-56) Belcher eschewed the more practical planning of J. F. Doyle's premeated entry, or E. W. Mountford's second place entry, (6-57) which had simple floor plans and efficient planning. Belcher placed his entry on the narrow front facing the prestigious Dale Street, and rammed an axial corridor through the public office to a termination in the lift, almost two hundred feet away. Even more dramatic was the building section. The public office rose through two and three storeys. (6-58) This was a 'standing advertisement' for a giant company, but it was accomplished at the expense of the building's subsidiary offices, which were squeezed among the voids of the upper floors. Spaces to let were relegated to the basement.

Unfortunately this grand attempt at elevating offices to the public building realm was never built. Belcher's influence through
built examples came through two other buildings. The first of these was designed in 1903 for the Royal London Friendly Society in the City. (6-59) This insurance office was planned surprisingly like speculative offices. The public office was placed at the rear of the ground floor. This was perhaps a clever effort on the part of the Society to get a greater rent for the front spaces than they themselves were willing to pay. Belcher celebrated the passage to the insurance office with an axial, domed entrance hall and vestibule.

Even more splendid was Belcher's effort for Electra House, designed in 1904 for one of the newcomer communications companies, the Eastern Telegraph Company. (6-60) (6-61) The building had a substantial amount of its space to let, but this did not deter Belcher from creating a richly embellished, vaulted entry hall. Perhaps no private company to this time had so magnificent an entry.

The clarity of intention in Belcher's designs was matched by the office building efforts of John Burnet. Whereas Belcher produced unquestionably grand, perhaps even extravagant designs, Burnet's were more subtle and more responsive to the business aspects of office design. Burnet's Beaux Arts training was evident in the plan of Atlantic Chambers in Glasgow, 1900. (6-62) The plan's general symmetry no doubt aided in its letting by allowing equally sized offices, but Burnet used the symmetry as a point of style. The central entry hall terminated in an octagonal space. The stair was balanced against the lift. Burnet took great care to shape all edges of this core, both in the hall and in the offices, to produce a nearly perfect bilateral symmetry. He even located the perimeter fireplaces symmetrically, despite an irregular site. What was surprising about this approach was that the symmetry was bound to be obscured by office partitioning. This was Beaux Arts planning in the extreme!
Over the next two decades Burnet produced several more careful, geometrically resolved plans. The main hall on the ground floor of the General Assurance Building on the Aldwych was at once a grand entrance and a clever geometric resolution of the irregular site. (6-63) Burnet's hall accommodated a sweeping stair and three odd-shaped lifts. In a departure from general practice, the entry to the insurance office was not off the pavement. Visitors passed through a sequence of spaces to get to the front office: through a passage, then the hall, and into a vestibule before reaching the insurance company offices. Most importantly, this was the same entrance to the lettable space above. Any Victorian architect would have taken great care to separate the entries, but Burnet combined them to the benefit of both.

Two of Burnet's other office building efforts showed similar care and skill in planning. His Kodak offices of 1911 were relegated to the first floor to allow ground floor shops. (6-64) Burnet mitigated the problem of climbing stairs by orchestrating the passage to the first floor. A simple centre ground floor entry led to a small lobby with an asymmetrical, almost residential stairway. This, after two landings, led to a 'reception hall,' nearly forty feet by fifty feet, off of which the office functions were placed. The Kodak spaces were small, yet carefully planned and serene. Burnet's Adelaide House, designed just after the war, completed his quartet of exemplary office plans. (6-17) Here the lobby was enormous: over forty-five feet wide and just as deep. Terminating in a bank of four lifts, it unequivocally expressed the importance of the businesses housed within.

The time between Belcher's extreme impracticality at the Royal and Burnet's polished generosity at Adelaide House was full of efforts.
to add a dash of style to office planning. Other designs showed different degrees of effort and grace. The more outrageous of these included attempts to plan interior spaces with singularly memorable shapes. In contrast to Victorian planning, where edges of major spaces succumbed to practicalities of light or location, several Edwardian efforts did just the opposite: major spaces were so powerful they distorted surrounding subsidiary spaces. Norman Shaw squeezed a circular, flat domed banking hall into the Parr's Bank in Liverpool in 1901. (6-65) He fit it into a rectangular envelope through four apsidal corner spaces and considerable poché. H. T. Hare's United Kingdom Provident Institution on the Strand achieved a similar effect in 1906. (6-66) Hare's space rose through two storeys, making a long climb to the offices above. Instead of poché, the design was resolved with odd shaped auxiliary spaces. Far more extreme than either of these and one of the most outrageous Edwardian office designs was T. E. Knightly's Birkbeck Bank near Chancery Lane, 1902. (6-67) Tucked within an unusually large building, behind a curiously outdated Free Classic facade, was a giant domed banking hall seventy-five feet in diameter. Knightly squeezed in a variety of functions, each deformed as necessary around the circle of the bank office.

More common were the gestures made in the planning of less spectacular buildings that nonetheless showed the same spirit of the day. A. N. Bromley, for example, made a sweeping gesture with his stair terminating at the entrance hall in the otherwise unremarkable plan for the National Telephone Head Offices. (6-68) Gordon and Gunton squeezed a two storey entry hall into their highly constrained Royal Insurance Building in the City. (6-69) (The vault was made economical in cost and volume through the use of Considere's patent
concrete.) Richardson and Gill showed care in the entry of their 43-53 Moorgate office. (6-70) The passageway, which crashed its way through the ground floor, was tamed through controlled geometric planning.

Whilst these solutions only affected parts of office buildings, some designs brought style to the whole of building planning, creating one of the most important developments of the Edwardian years. Among the first of these was G. J. and F. W. Skipper's Norwich Union Office in Norwich, already mentioned for its contemporary office planning ideas. (6-8) (6-9) The promise of the plan was rewarded in the main space: a public space in the best sense, it spoke eloquently for the power and stability of the company. Stately rows of two storey columns completely encircled the main clerical space, which was centred on axis with an exterior arrivals court.

Another axial two storey effort, but with American bank qualities, was designed for the shipping company, Elder Dempster and Co., in Liverpool in 1906. Briggs and Wolstenholme, F. B. Hobbs, and Arnold Thorneley were the architects. (6-71) Subsidiary spaces on two storeys flanked the hall on two sides. Similar also was W. Campbell Jones's Hong Kong and Shanghai Bank in the City, designed in 1914. (6-72) Here Jones developed an axial passage, not unlike Belcher's in the Royal design, that ran through the whole building and terminated in a domed space just before the manager's office. Regular columns and subsidiary domes reinforced the axiality. A last example of these integrated designs was Bush House. (6-73) The domed porch entry was connected to the bank of lifts with an entrance hall lined with closely set columns - a grand space in which to display the various products sold by the companies letting offices above.

The Bush House represented the closing of early twentieth century
office design in several respects. Those related to external style will be analysed later. In planning it is remarkably reminiscent of the grand planning efforts of Belcher's design in the Royal Insurance Competition twenty-five years earlier: axial, grand in scale, monumental, rich in treatment. These features, long the domain of public buildings, had finally become integrated in office buildings.

CONCLUSION

The vast differences between the forms of Edwardian office buildings and their Victorian predecessors makes one believe that those built in the late 1890's must have been very out of date by 1905, and antiquated by 1915. The major changes evident in planning, building size, and influence of style on form were only part of the sweeping changes affecting office buildings. Compared to style, services, and structure, the formal developments appear to be relatively subtle.

Their significance lies in the forces that created them. Business needs were growing and becoming more analytical. Office design became acceptable as an endeavour of leading architects. Offices in response grew to be among the largest and most monumental buildings in the country. In doing so they arrived at the threshold of our modern era.
EВOLUTION OF STRUCTURE

'FIREPROOF' CONSTRUCTION

1840 1850 1860 1870 1880 1890 1900 1910 1920

Theoretical and material problems

Theory solved
National Safe Deposit Co.

Patent 'fireproof' floors

Timber floors

FRAMING SYSTEMS

Problems with iron

Masonry bearing walls & fireproof floors

Criticism of American framing

Full framing inside
Concrete framing

Cast iron internal framing

Wrought iron columns

1855 MBA

1894 LBA

1909 LBA

Steel columns

1909 LBA

Wrought iron beams

Steel beams

Cast iron beams
CHAPTER 7
EARLY TWENTIETH CENTURY STRUCTURE:
CONTROVERSY OVER FULL FRAMING

The new century heralded the arrival of new structural materials and techniques in Britain. Load bearing masonry, the mainstay of both structural support and architectural style since the Great Fire, suddenly was challenged by full framed construction in steel and reinforced concrete. The gradual acceptance and integration of full framing forms a significant chapter in the evolution of office buildings.

Full frame steel construction was important to more than just offices. It was a controversial subject for fully twenty-five years before it was accepted. Historians have not fully recognised its embryonic years in Britain in general; much less is known about office buildings. The topic is so important to the development of modern architecture that it warrants full attention. To understand its significance in office buildings, it is necessary to identify architectural attitudes and general developments from the 1880's, when the British first became aware of what their American 'cousins' were doing. Then full framing in offices can be analysed, followed by significant developments in reinforced concrete framing.

FULL STEEL FRAMING

The invention and development of the load bearing frame in
Chicago office buildings in the 1880's, and its rapid exploitation in major American cities, is a familiar story, and one of the seminal events in the development of modern architecture. In Britain the history of full framing in office buildings was quite different. It was as slow, complicated, and interwoven as the American events were fast, forceful, and to this day, still remarkable. Two differing conclusions about British events have been drawn by modern analysts. Marion Bowley has characterised the period as one lacking in innovation, due, in good part, to aesthetic attitudes. Alastair Service, on the other hand, has identified several full framed office buildings of the period as precursors of rationalist, modern architecture. Both of these analyses, however, are limited in their scope: by omitting several critical issues, they present oversimplified and imbalanced conclusions. Additional depth is necessary to sufficiently outline the provocative aspects of full framing. Service concentrated on building expression and overlooked the greater number of office buildings that employed full framing with no visual acknowledgment. Bowley, whose work reflected the enthusiasm for progress of its mid-1960's publication date, failed to consider a full range of technical issues to which late Victorian and Edwardian architects were especially sensitive.

The concept of full framing challenged the most fundamental technical and aesthetic bases of Victorian and Edwardian architectural thought. Some technical understanding was erroneous, and the aesthetic beliefs emotional. Among architects there was, however, a highly developed, commonly understood, logical and philosophical approach to architectural design which accounted for a wide range of building issues, including structure.

The development of the full frame in Chicago, including its im-
Applications for architectural expression, took less than ten years. William LeBaron Jenney's Home Insurance Building, built in 1884-85, was the first full frame; his second Leiter Building, which Condit cites as the 'first...full and unambiguous...architectonic expression' of the full frame, was executed between 1889 and 1891. During the interim period and into the early 1890's, other architects and engineers developed a full range of approaches to the foundation, framing, and windbracing problems of their skyscraping offices. The Chicago phenomenon was a unique combination of problems and opportunities, approached with creativity. In a city with little history and few building regulations, architects and engineers eagerly responded with new building forms for a clientele holding few stylistic predilections. The goal was well lit, efficient and inexpensive office space. Furthermore, unstable subsoil limited the success of traditional building techniques. Jenney's original motivation for the full frame was simply to increase interior lighting levels through larger windows. It was found additionally to offer thinner walls, lighter weight, reduced cost, reduced construction time, and greater interior space efficiency. Advantages such as these were most evident in the early skyscrapers, buildings ten storeys high.

Initially in Britain, skyscrapers were viewed as the ultimate conclusion of the full frame. This association between form and technique did much to discredit the construction method and discourage local applications. In Britain office buildings rarely exceeded ten storeys, but nevertheless full frame construction became common following the First World War. The frame gained acceptance on its less obvious assets: space efficiency, weight, cost, and time.

The British were aware of full framed construction since John B. Gass reported to the RIBA on Jenney's Home Insurance Building in 1885.
He made note of 'iron columns run up the full height in the centre of brick piers, (with) iron window lintels resting on the columns.' Included in the presentation were three plans of the building, clearly indicating the framing system and its implications for external expression. By the time the British took extensive notice of American developments ten years later, the full framed system was essentially complete in its development. It remained only to be applied in Britain.

ESTABLISHED ATTITUDES

The Builder, in a long and well illustrated article on Chicago business buildings in 1892, maintained a cautious respect for them as inevitable responses to commercial pressures, while expressing 'no approval of whatever boisterousness may be characteristic of that city.' It further noted 'the great office buildings of Chicago are looked upon by their owners simply as sources of revenue, not as architectural monuments. Such, indeed, an office building cannot properly be.' Some months later it argued that the Chicago office buildings had 'ceased to be architecture, in any sense which that expression has hitherto been understood in the world.' When it published notice of the Betz Building in Philadelphia, a 'mass of steel framed business burrows,' The Builder sharply criticised its granite Romanesque curtain wall. Claiming 'certainly it is not architecture in any true sense,' The Builder would have preferred 'terra cotta filling, where filling was required, and show (ing of) the steel piers.' It called the Betz building 'one of the most audacious and costly descriptions of sham which the history of architecture has to present.'

The stylistic attitude expressed by The Builder was by no means
unique. It was merely an expression of the two most basic Victorian principles of architecture, principles which transcended all stylistic predilections: truth in construction and visual stability in overall form and architectural character.

**Stability**

The importance of stability to Victorian thinking has already been discussed. At the turn of the century established attitudes remained as strong as ever. Within this stylistic milieu, the skyscraping American office buildings, with their repeated floors of uniform height, curtain walls predominantly of glass with thin spandrel panels, minimal expression of columns and 'unartistic' proportions, could please few architects. The American buildings were called 'hideous' and 'ugly.' Their height-to-breadth ratio was considered a serious problem, 'really an impossible one with more than a certain number of storeys.'

Skyscrapers notwithstanding, this philosophical point of view was the basis for British criticism of their own iron architecture. In this area the British certainly had more experience than the Americans. The Crystal Palace simultaneously represented both the hopes and 'failure' of iron construction and was the focus of continuing criticism. James Fergusson, writing on 'Ferro-Vitreous Art' in his popular *History of the Modern Styles of Architecture*, set the theme: the Crystal Palace could never be 'architecture.' Its greatest defect was that 'it wants stability, and that appearance of permanence and durability indispensable to make it really architectural in the strictest sense of the word.' E. M. Barry, speaking at the Royal Academy, paraphrased Fergusson, and added, that the aesthetic need for stability was 'obvious.' William White, a leading Ec-
clesiologist, cited the 'higher essential principles' which demanded 'massiveness counterpoised' and 'dignity, depth, solidity, repose, and beauty.' He argued at the RIBA in 1880 that 'iron architecture carried out as 'an architecture' must fail to be architecture.'

Wyatt Papworth, in his revised editions of Gwilt, chose to let stand Gwilt's warning that cast iron supports, while perhaps allowable for inferior buildings, were not to be tolerated in buildings of the first class.

Truth

The architectural establishment, steeped in the teachings of Pugin and Ruskin, demanded 'truth' in construction. Materials were to be used in a manner expressive of their 'character' and physical properties. No material could be used in such a manner as to appear to be another. 'Truth' eschewed covering one material with another unless, as with gold leaf or marble, the surface material was expressed as such, and understood to be only a veneer.

A stylistic dilemma posed by iron was when used in the thin sections its strength allowed, its proportions failed the test of stability. Iron could be made to look more massive, as, for instance, through the use of hollow columns or cornices. Then it failed for misrepresenting its material properties. If this were done, White argued, 'we shall then arrive at an uncommonly hollow state of things altogether, under which architecture will be extinguished.' He summarised by expounding that

for all purposes of architecture of a monumental character, for all buildings that are intended to appeal to succeeding generations and stamp their indelible mark upon a highly civilised people, we shall have to look elsewhere than to iron. We must not look to this material for a permanent embodiment of art, nor for the idealization (sic) of immaginative or poetic thought.
White had cited one method of sublimating truth in iron construction. The other was by covering it with another material. Of the various examples of this offense, probably none was more common than the shop front with its iron bressummer encased with brick. Criticism was frequent. G. E. Street in 1880 called these concealed girders the 'enemies to all true construction.' Another Royal Academian, T. G. Jackson, expressed the same feeling as late as 1904, and offered his solution: 'to bring the new construction, consisting of two steel stanchions and a beam across, within the domain of art, it was only necessary that it should be visible.' This 'new' construction was at that time at least seventy years old. His solution was a common preference among 'art architects,' and was executed by several of them. William Burges, as noted earlier, had set the example on a warehouse as early as 1866. In reporting Jackson's lecture, The Builder concurred that 'visible steel structure is much better than sham stone structure,' but allowed that real stone was better than either.

These expressions indicated their proponents' lack of contact with the technical state of knowledge. As was noted, architects concerned with fire-resisting construction had been in agreement since the 1870's that a covering of some casing material was necessary to protect an iron or steel frame from destruction in fires. The call for truth in construction, however, was slow to subside. It had earlier kept T. Hayter Lewis, a leading advocate of fire-resisting construction, from casing an iron column with a protective plaster coat. Similar philosophical scruples were expressed by Bannister Fletcher at the turn of the century. Fletcher, however, reversed the argument. He believed that architects couldn't think much of a material that required covering up as iron did, and that the great-
est drawback to its use in buildings of any architectural pretensions was its necessity of 'practically being thrown away, and... plastered over.'28 Unexpressed metal frames were frequently cited as 'shams.' Robert Kerr, in his 1891 edition of Fergusson's History, omitted the earlier criticism of 'Ferro-vitreous Art' to replace it with a more generalised argument against 'wholly indefensible sham-work properly so called.' He elaborated: 'the surface, or skin, should, as intimately as possible, concur, coincide, and correspond with the subcutaneous muscle and bone.'29

The Vienna Exhibition Building by British engineer J. Scott Russell was, when built in 1874, a major structural feat for its 360 feet clear span. At the RIBA it was chastised in discussion for hiding its innovative iron construction behind an Italian screen of stone.30 Closer to home and a much more evident 'sham' was the Tower Bridge, built between 1886 and 1894 by City architect Horace Jones and engineer John Wolfe Barry. This design was an architect-engineer collaboration unlike any before.31 Barry designed a bridge with two steel framed towers. In deference to the adjacent Tower of London, Jones clothed the towers in a mock Gothic of granite and brick. Tower Bridge became the bête noire of hidden steel construction. H. H. Statham, editor of The Builder, was perhaps publicly the most expressive critic of the bridge. In an article for engineers explaining the 'Esthetic Treatment of Engineering Work,' he called the bridge

the most terrible and monstrous piece of sham ever erected. The masonry towers, considered per se, are very poor - tawdry Gothic, totally deficient in breadth of style or power of effect - but they become simply contemptible when we know that they are only masonry skins carrying nothing, and are, in fact, supported by the steel work which they conceal.

He criticised furthermore the visual instability caused by the suspension cables, which would have pulled the towers over if it hadn't
been for the steel frame. It was a 'foolish piece of elaborately constructed scenery.' In his Modern Architecture he produced a sketch suggesting a redesign for the bridge. Through The Builder he condemned it along with the Vauxhall Bridge, as 'one construction pretending to be another.' Statham wasn't alone in his disapproval. Paul Waterhouse referred to the towers as 'great humbugs.' W. D. Caroe objected to the bridge 'in the strongest manner possible.' To Beresford Pite the 'Gothic gimcrack of the casing' was a 'ridiculous departure from the truth...and therefore heinous.' The bridge was still cited as late as 1909 in a RIBA Prize Essay by Horace Cubitt as an 'engineering design with 'added architecture'...of which both architects and engineers were ashamed.'

The Tower Bridge denigration even carried to the Royal Academy, where in 1903 Professor Aitchison cited it as a 'glaring instance of ironwork very improperly used.' Aitchison was perhaps the only leading architect to consistently advocate the exploration of iron and steel construction. In 1903 he was arguing, almost verbatim, the points he delivered to the RA in 1883. Then he called engineers the 'true children of the age, whose sole aim is utility' and blamed the position of architecture on the retirement of its professors from the strife of the world. Aitchison, however, disliked American full framed buildings as much as he did the Tower Bridge. He cited the 'false appearance' of iron covered over in Greek or Roman columnar designs which 'betrayed the architect into solecisms which are almost ludicrous.'

The Builders' Journal subtitled its 1902 reprinting of an American article on 'The Aesthetics of Constructive Design' as 'an argument for shams.' In this review of east coast American developments, the author analysed the inherent conflict between truthful
construction and the appearance of stability. Whilst citing historical precedents, he argued that solidity was the primary goal, and that, if showing exact materials in their exact location conflicted, the latter must give way to a less literal expression.43

What is significant in all of this criticism is that it was so unilateral and one dimensional. Amounting almost to sloganism, it indicates the depth to which truth in construction saturated architectural thought, and the inflexibility of what was essentially a philosophical argument.

Tall Buildings

The association between full framing and its logical conclusion, the skyscraper, contributed much to the solidification of attitudes against the construction technique. As has been noted, Victorian Britain had seen a slow but steady increase in building height, stimulated first by rising land values and then by the general utilisation of the lift in the 1880's. The construction of several hotels and flats, including the notorious Queen Anne's Mansions did much to rally opinion against high buildings. Tall buildings were felt to block light and air in city streets, create traffic problems, and tax the fire brigade's resources. It was generally held that the maximum reasonable height of a building was equal to the width of the street on which it fronted. With this in mind, but recognising commercial pressures, the London County Council had established a ninety feet height limit on buildings in 1889, and lowered it to eighty feet in 1894, with hardly a word of opposition.

So strong were the associations and feelings against high buildings that many of the periodical articles and public lectures on full framed construction became forums for the denigration of the sky-
scraper. In reviewing C. V. Childs' article in Engineering, the Builders' Journal thought it 'appalling' to think what the streets of London would be like were fifteen or twenty storey buildings permitted, as traffic was already in 'so congested a condition.' At the Architectural Association in 1902, W. E. Riley, the LCC Architect, empathetically reported that many 'experts' in New York were bitterly opposed to the high buildings which were a 'hideous disfigurement' of the city. In the same meeting Max Clarke feared the time when such buildings 'should unfortunately arrive in London.' A year later at the Society of Arts, Henry Holloway was careful to separate his subject, a comparison of English and American methods, from skyscrapers, those 'monstrosities' which, he was glad, 'the law did not allow...to be built here.' This was echoed in discussion by several architects at the RIBA in 1905. John Slater 'ventured to hope that they would not see in London any construction like those shown.' In the same meeting, Howard Colls, a leading builder and office building developer, criticised New York office buildings for their diminution of the sun and their influence on wind effects, and doubted that anyone would be able to walk near them. 'It would be obvious to everybody that if they put up buildings in streets which prevented the streets being used, the result could not be considered satisfactory.' Another builder thought it would be 'like living in a pit to walk through the streets with such buildings on either side.'

On other occasions the tall building in London was chastised for essentially the same, practical reasons. John Belcher, in his Presidential Address at the RIBA in 1904, lamented the increased height of buildings which 'produced an atmosphere of gloom.' The entry court of Queen Anne's Mansions was a case study of the darkness associated with tall buildings. Earlier, the Builders' Jour-
nal, when reporting a fire in the lofty Hyde Park Court Mansions, ad-
monished that 'the best plan is undoubtedly not to build (tall build-
ings) at all.' The Builder thought that tall buildings were not
desirable on hygienic grounds, and speculated that they were not
likely to be permanent. Hope was placed on improvements in traffic
to meet the demand for space.

Technical Problems

Just as the uproar over skyscrapers was based on more than sty-
listic grounds, the attitudes toward the use of iron and steel in
walls went beyond the issues of truth in construction and problems
of stability and repose. From the early iron framed mills, the
British had almost a century of experience in iron framing for in-
ternal building supports. Office buildings commonly employed it
since the 1850's. Wrought iron girders and joists spanned between
cast iron columns, allowing either large, visually open, or easily
subdivided spaces.

Iron was well understood by Victorian architects. Whilst its
structural exploitation produced some of the century's more memorable
buildings, its numerous physical liabilities caused it to be used only
when brick or stone wouldn't suffice. Then it was used with great
cautions. Architects had a certain amount of justification in avoid-
ing it for their monumental, permanent work. Experience with its
technical problems, drawn from a full range of applications, tended
to reinforce aesthetic feelings. Compared to masonry, iron expanded
and contracted considerably, transmitted heat rapidly, condensed
in damp weather, melted or fractured in fires, and rusted almost un-
controllably.

The Crystal Palace was reported to 'leak like a cullender.'
during its final days in Hyde Park, as did the iron exhibition building at Manchester a few years later. After its re-erection at Sydenham, the Crystal Palace remained a familiar building to architects through its continuing exhibitions. As E. M. Barry pointed out, it failed even in its primary duty of affording shelter. Citing the expansion and contraction of its members, Barry called it 'in perpetual motion.' He pitied the shareholders, who had 'but too much reason to ponder over the questions of stability, in connection with the cost of repairs.'

The problem of finding satisfactory fire protection for iron showed one advantage of masonry. Even after the 1870's, iron and steel framing was regarded with skepticism. Archibald Dawnay, a steel fabricator who presumably stood to gain from full framed construction, warned in 1901 of 'total destruction and serious loss of life to come' from the 'mere veneering' of brick over steel in exterior walls. H. Chatfield Clarke, an experienced City office specialist, argued the point more emphatically: external walls of city buildings should be 'real walls capable of supporting themselves.'

Similarly, Henry M. House, in a discussion at the Institute of Civil Engineers, expressed fear for office buildings on steel frames in fire, not from fire originating internally, but from their neighbours. He recommended masonry bearing walls for the lower storeys.

More concern was expressed, however, on the issue of rust. The attitude of most architects was perhaps expressed by Robert Kerr, speaking in a discussion at the RIBA in 1882. Kerr didn't feel iron was to be important in the future:

I do not think it promises anything permanent, that is to say, quite satisfactory in the way of that long permanency which we attach to architecture of the highest class. There is the fatal objection to oxide, especially in a climate like this, in which it forms so rapidly and is removed so readily. The use
of paint upon the material is a most unsatisfactory way of preventing this process. We have no paint yet invented which accomplishes this degree of preservation of iron in a permanent, practical way. 58

While Kerr's expression might be seen as tinged with stylistic prejudice, those of the engineers were not. Throughout the latter half of the nineteenth century, the issue was raised again and again. Much engineering experience was gained through the use of iron in exposed positions. George R. Brunel, in a well documented lecture at the RIBA on the durability of building materials, warned that, of the various known preservative coatings for iron, none were considered a desirable defense against rust. 59 Nine years later in 1863, Edwin Clarke noted at the Institute of Civil Engineers the 'utmost importance' of regular painting of exposed ironwork. The 'fatal rapidity' of rust was due to the moist, smokey atmosphere which surrounded most applications. He also warned against occasional painting, and advocated continuous maintenance programmes to keep deterioration safely in check. 60 Richard Moreland, an iron fabricator and 'fireproof floor' patentee, later warned of the 'risk of ultimate disaster' with wrought iron girders. He also noted that the importance of regular painting was not sufficiently appreciated, 61 thus repeating a warning of Edward Matheson a few years earlier. 62 Wrought iron was well recognised as rusting more than cast iron. Steel was thought to be similar to wrought iron, but at the time, wasn't conclusively understood. Matheson feared the use of steel would aggravate the problem, since steel, with its potential for thinner sections, had less of a factor of safety against deterioration.

It remained for those using iron to plan on its being repainted on a regular basis. The belief that painting was the only effective way of preserving iron or steel contributed to an almost universal
notion that iron and steel should not be used in inaccessible locations where it could not be reached for repainting. The most inaccessible places were within the walls of buildings. Years of experience confirmed the wisdom of never enclosing iron in locations with a likelihood of remaining damp. At one of the more celebrated RIBA discussions on iron in 1880, Liverpool's J. A. Picton advocated the use of iron for internal work. On the use of iron for external walls he was firmly opposed. He criticised Ruskin's aphorism that iron should only be used as a tie in masonry walls and commented 'every practical builder knows that for this purpose iron is about the worst material that could be employed. Its operation being to disintegrate and separate by its oxidation and expansion and to destroy rather than to support.' Others at the meeting concurred. G. E. Street felt the greatest snare 'to architects was the use of iron and steel girders in the middle of their walls,' and 'thought it delightful that they were rotting rapidly.' Professor of Engineering at University College, E. A. B. Kennedy concurred with this experience. He added that covering iron with brick was seldom done by engineers, and urged architects to likewise abstain from the practice.

In another RIBA discussion T. Hayter Lewis noted that the courses of stonework had been 'almost entirely destroyed' by the rusting and expansion of iron cramps in buildings by Wren and his protégés. He believed bronze should be used for such purposes. The effectiveness of concrete as a casement was not conclusive at the time. The durability of iron ties was questioned at the Institute of Civil Engineers in a discussion on iron in concrete in 1863. Even as late as 1896, Henry M. House expressed apprehension concerning the rusting of steel in walls. He argued that the conditions
which provoked rusting were so variable that there were no guaran-
nees as to the safety of steel.\textsuperscript{68} The collective experience of mem-
bers of the Concrete Institute supported House's apprehension. A
1901 call for evidence on the life of steel in concrete brought a
response in which two thirds of the replies reported problems of
steel rusting in concrete.\textsuperscript{69}

The general consensus was to leave iron out of walls and avoid
all hollow spaces within fabricated sections. Brunel had noted in
1854 that rust deterioration was maximised in damp air in confined
positions.\textsuperscript{70} C. H. Driver, in a lecture at the RIBA advocating re-
appraisal of the use of iron and urging its greater use, warned
against hidden iron, because without inspection and protective re-
painting, 'inevitable destruction...must result from rust.'\textsuperscript{71} Ewing
Matheson, an iron manufacturer, spoke out as vociferously against
hidden iron. He noted the common box girder over shop fronts, which
not being airtight but being inaccessible would scale, he felt, in
five years and require rebuilding before the expected life of the
building. He recommended filling box girders with concrete to make
them airtight. Matheson further cited the scaling of iron on the
Foreign Office, inaccessible for repainting, and feared its total
destruction within twenty years.\textsuperscript{72} Edwin Clarke at the ICE had ear-
lier warned against the creation of any hollows which couldn't be
reached by the painter's brush,\textsuperscript{73} as Joseph Jennings did later at the
RIBA.\textsuperscript{74} Essentially the same admonition and suggestion expressed
by Matheson was carried into the twentieth century by G. A. T.
Middleton, in his encyclopaedic work, \textit{Modern Buildings.}\textsuperscript{75}

It is not likely that many architects would have entertained the
notion of full framed construction or the extensive use of iron or
steel in external walls. Significantly, during the extensive criti-
cism of various clauses in the formulation of the 1894 London Building Act, there was no discussion of external wall framing beyond that of shop front bessumbers.

Within this milieu of technical uncertainty, there were only minor expressions of confidence in the life of iron and steel. Some were in error. Moreland, for example, thought that lime preserved iron; so did C. H. Smith. On the other hand the PICE had a small notice quoting M. Cottacin and M. Eiffel in 1888, who advocated cement as a preservative for iron. These were in the minority, however. What is certain is that these few expressions were not sufficient to allay fears generated by years of experience.

THE CHALLENGE OF THE FULL FRAME

Complete information on American framing methods began to arrive in force towards the close of the century. The first major public exposition came in 1896 when Edward Shankland, a leading Chicago engineer, lectured at the ICE. In an extensively illustrated presentation, Shankland elaborated on many of the essential constructional aspects of the full frame. He included methods of designing for wind resistance, live loads for various uses, foundation design, cost of framework, and construction time. Shankland's presentation almost coincided with an extensive article in the Builders' Journal. Lectures at the AA by T. C. Cunningham, an engineer, at the RIBA by R. W. Gibson, an English architect practicing in New York, and continual periodical coverage and lectures guaranteed that, by the arrival of the new century, no architect or engineer could have escaped notice of construction 'on the American principle.'

A Comparison of Techniques

American methods challenged the British establishment at more
levels than those of truth and stability and the life of steel. They challenged the traditional process of building, cultural attitudes regarding the place of buildings in society, building economics, and finally, the relationship between architects and engineers.

Traditional office building construction, while displaying a range of variations in minor aspects, consisted essentially of masonry bearing walls for external and party walls, cast iron columns for internal support, and, by 1890, steel beams, often encased in fire-resisting floors. Foundations and basement retaining walls were generally of brick, stepped at their bases, bearing on unreinforced concrete footings. For unstable or irregular soil conditions, mass concrete rafts, as thick as six feet, were used to distribute loads over entire building areas.

The cast iron columns typically featured joints at each floor level. The grid of columns and beams depended upon the external walls for edge support and lateral bracing. Building construction was paced by the speed at which the masonry walls could be laid; the walls were the stabilising elements. Steel beams and bressummers were designed with room for expansion at their ends. In the case of shop front framing, bressummers were designed to support all of the walls above. This system was used for buildings of all sizes, including the highest office building built to 1900, the ten storey Salisbury House in the City. 84

External and party walls, by building regulation, could be as thick as 2'-10" in London, 85 2'-4" in Liverpool, 86 and 3'-9" in Glasgow. 87 Walls were often thicker to compensate for limited bearing area or purely for stylistic reasons. E. W. Mountford's Northern Assurance Co. building in the City, for example, had 4'-0" thick walls at the ground floor. 88
In contrast, construction 'on the American principle' was quite the reverse. The external walls, dependent on the frame for their support, could be made quite thin. They were generally twelve to twenty inches thick. Foundations were piles, caissons, or, more commonly, rafts below each stanchion with a grillage of steel beams spreading the load over as much horizontal area as was required in a minimum vertical dimension. The buildings weighed less, consumed less material for the volume enclosed, and were spatially more efficient. Full framed construction also offered a rigidity not possible with the inherent discontinuity between bearing wall and girder. Perhaps what provoked the British more than any other feature was the speed of construction: a sixteen storey office building was able to be built in seven to twelve months. The steel was built to seven or eight storeys before the walls were started, allowing simultaneous enclosure of several floors at once. The ground floor walls might be built last. 89

Architects' and Builders' Reaction

The reaction to the full frame was one of interest in the achievements of the 'go-ahead American cousins,' but caution in its application in Britain. John Belcher, speaking as president of the RIBA in 1905, thought that clients would be aghast, since they 'always wanted to know if the new methods had been done in Queen Anne's time.' In America it was easier, Belcher thought, because if a person tried a new idea and it failed, he 'could move a thousand miles off and start again.' 90 Belcher urged acceptance of the full frame, however, but cautioned that architects would have to become engineers in doing so. Several prominent builders were less enthusiastic. Benjamin Greenwood, president of the Institute of Builders, 273
admitted 'admiration...but not...envy.' Howard Colls feared the American system would not produce good work, that 'no building that was constructed beyond a certain speed could possibly be as good as one which was more leisurely done.'

Architects, including John Slater and Henry Holloway, had similar feelings. H. H. Statham thought speed would lead to a standardisation that would 'check originality' in building. In a word, the time honoured traditions in 'building' were being challenged by 'construction,' a distinction which Ernest George made in his RIBA President's Address in 1906. George expressed hope that 'construction' wouldn't become prevalent in his time. This attitude was essentially the same as that expressed by T. B. Winney, a practical City office building specialist, who dismissed a Hennebique representative outright with the erroneous reasoning that his system was 'based on the American principle.'

These men expressed the views of the establishment. Their feelings were institutionally reinforced by the building regulations, particularly those in London. Delissa Joseph, a City office and warehouse specialist, reported to the RIBA in 1898 that he had investigated full framed construction in the City, but concluded there was no advantage to it. The regulations required the frame to be covered with thick solid masonry, and with 'false material' to enclose at least half of the external wall. Shortly afterward, R. Langton Cole suggested a 'loophole.' Since the London Building Act measured the height of external walls built upon bressummers from the top of the bressummer, Cole speculated that a building with a bressummer at each floor level and a masonry enclosure could be interpreted as a series of one storey walls, no matter how high the building. The effect of this interpretation would have resulted in only a nine inch wall for
office buildings. There is no indication that this idea was ever pursued; the Council steadfastly refused to reduce wall thickness requirements.

Cole was perhaps the first to publicly appreciate the full frame. The Times later ran a series of articles on the steel trade in 1900, urging the adoption of full framing, if only to stimulate the languishing steel industry. These were isolated instances, however. Full acceptance of American methods did not come until 1904 when the RIBA standing Practice Committee recommended to the County Council to sanction full framing. Following this, several writers began to urge full framing; they echoed the American attitude toward building costs. The Americans had earlier pointed out that by increasing the height of their buildings, they first reduced the cost of space per floor, then increased the return on investment, and lastly, increased the budget for external decoration. So established were British architectural attitudes to building standards that it is unlikely that very many had ever considered building economics in quite the same way as it was about to be discussed. W. Noble Twelvetrees, an engineer, author, and regular contributor to The Builder, put the issue on a straightforward profit making basis. He compared a hypothetical building built within the LBA and the same sized building built with thin walls and a full frame. For a 5000 superficial square feet building, twelve storeys high, Twelvetrees was able to show an increase in rental income of £720 per year due to the eight percent greater building efficiency created entirely by the thinner walls. Victor Horsbrugh made a similar analysis in his 1907 RIBA Prize Essay. He compared the areas of steel stanchions with those of brick piers, which resulted in a four percent difference in area for a six storey building.
Building economy was also analysed in terms of building time. B. H. Thwaite in 1904 spoke admirably of the steel framing systems enabling buildings to be built in one quarter of the time required by ordinary methods. Earlier, Charles Heathcote, Manchester's leading commercial architect, spoke at the Society of Architects and urged the speeding up of British building work to a position of 'happy medium' between its traditional pace and that of the Americans. Martin Shaw Briggs pointed out that the hurry of full framed construction was not the result of any 'scamping' that would be detrimental to finished building quality, but rather a 'highly organised and scientific system of labour and transport of material.' He additionally urged the study of the influence of iron, just as they studied the influence of Garden Cities. In his RIBA Prize Essay in 1909, Horace Cubitt pointed out that the effect of compound interest over a long period of time encouraged the construction of a cheap building over a traditionally constructed one. If the difference in cost between a 'hundred years' building and one that was built to last at least double that was computed in terms of compound interest, the difference at the end of ninety or a hundred years would provide enough money to pull the building down, rebuild a new one, and have a substantial balance remaining.

Cubitt, like many others, did not consider steel to be a permanent material. Edwin Garbett feared that severe rusting would take place before the eighty or ninety year life of a standard ground lease. Horsbrugh estimated that, with adequate care, steel might last a few centuries. The concern for permanence, once so basic a component of British architectural attitudes, was mitigated by the growing realisation that functional needs of commercial buildings were changing rapidly. Buildings then being built, regardless of
their construction technique, would quickly be out of date and require modification or rebuilding. Cubitt estimated 'two, three, or perhaps four generations' as the life of a commercial building, while steel, the framing material for such 'semi-temporary' buildings, had 'in all probability...a limited life' of about the same period. By contrast, in America fifteen years was planned as the economic life of a building. Architects failed to recognise that the life of a commercial building was already measured only in decades, especially in the City of London. As they modified their cultural expectations, however, theoretical and practical evidence mounted in favour of a long life for steel. But the evidence was erratic. As late as 1906 G. A. T. Middleton wrote in his Modern Buildings that the permanence of steel framed structures was 'at present problematical,' however, limited experience indicated the life of such structures 'may be considerable.' Middleton urged examining small portions of the structure every fifteen or twenty years, but warned that this precaution was no guarantee that some undetected spot might not be dangerously attacked. The Builders' Journal was perhaps the most knowledgeable periodical on this issue. As early as 1897 it quoted a German source who noted that cement offered excellent protection for iron, even under water. In 1900 it recognised that iron could not rust without exposure to air and moisture, and that cement mortar provided protection that was 'practically everlasting.' In 1902 it printed an article by the American expert on full framing, J. K. Frietag, entitled 'The Permanency of Steel Framed Construction.' Frietag belittled earlier investigations of rusting in railway viaducts and elaborated on the danger inherent in lime mortar. He claimed conclusively 'cement mortar is now generally regarded as the most per-
fect conservator of iron and steel."

Essentially the same argument was made by Charles Heathcote at the RIBA in 1903 when he advocated cement concrete as the only rust-proof and fireproof protector for steel. He cited the New York subway as an example of positive encasement.\textsuperscript{117} The Builder's first note of the preservation of steel was a 1903 article on the superiority of cement in inhibiting rust.\textsuperscript{118} Reinforced concrete construction at the time was probably the single most important testing ground in Britain. L. G. Mouchel, British representative of the Hennebique Ferro Concrete Co., cited 'indisputable proofs' of the protective benefits of concrete encased steel, and argued that the issue of preservation need no longer be raised.\textsuperscript{119} Mouchel was able to cite instances of the action of concrete in cleaning rusted steel after a month's contact. Testing of samples at the National Physical Laboratories in 1908 led to the same conclusion.\textsuperscript{120}

A 1906 report by the San Francisco Structural Association, carried in The Builder, pointed out the dangers of rust formation in cinder concrete.\textsuperscript{121} Breeze concrete, the British equivalent, was often preferred over other types of concrete for fire protection, and that practical experience may have led to much of the suspicion concerning the life of steel. Skepticism remained; as late as 1909 the issue was still topical. Several periodicals carried reports of conflicting evidence from experiments in the United States.\textsuperscript{122} Ernest R. Matthews, speaking before the Society of Engineers, commented that people still held the belief that steel corroded in concrete.\textsuperscript{123} Matthews found it necessary to cite experiments in Germany, United States, and England, and elaborate on the theoretical aspects to prove the safety of steel in concrete.

The RIBA's Standing Practice Committee's recommendation of 1904.
to allow steel framing came at a time when the integrity of steel was still not certain. Indeed, it seems likely the recommendations brought the full framed construction issue closer to home, stimulated reservations and rallied support. When the LCC initiated plans in 1905 to develop regulations for the steel frame, the RIBA, along with the ICE and others, protested. They argued that specific rules should be established and sanctioned by Parliament. It wasn't until 1908 that the RIBA published its recommendations, which with modifications, became the London Building Act (Amendment) Act 1909. It incorporated, in essence, the 1904 recommendations and was the first LBA to establish standards for live loads and wind loads. It additionally stipulated the encasement of steel, as much for fire-resistance internally as for rust protection.

The 1909 LBA brought architects face to face with an issue they had foreseen for years but never really acknowledged: their working relationship with engineers. The dilemma was which aspect of design, architectural or engineering, took precedence in building organisation. When architects calculated their own structure, and particularly when they were using masonry vaulting and timber trusses, there was no problem. Architecture had for so long been the visual expression of structure that the idea of one person determining the structure and the other developing the expression threatened its very basis. This was additionally complicated by a fact the perspicacious Horace Cubitt pointed out: the inherent material limits of steel were far in excess of functional needs. Design with steel became a matter of designing economical, rational systems rather than designing to the 'natural' limits of a material.

The relationship with engineers was probably tenuous and erratic at best. It was expressed at the AA in 1898 that architects who em-
ployed engineers often did so with little knowledge of structural calculations. More understanding and less dependence was prescribed for architects. Fear was expressed that architects might be 'left behind' by engineers, and that while engineers might well do without architects, the reverse certainly wasn't true. 127 T. C. Cunningham in 1902 pointed out that structural attempts of architects invited the 'profane ridicule' of engineers to an extent which probably matched architects' denigration of engineers' attempts at decorating structures. 128 One aspect of American office building design that impressed and threatened British architects was the degree to which engineering design was a part of, and sometimes took precedence over, architectural considerations. John Belcher undoubtedly expressed the fears of many when he remarked that the American architect was expected to 'keep a tame engineer on the premises.' 129

Quite the reverse position was expressed four years later by Horace Cubitt in his 1909 Prize Essay. He felt that architects shouldn't fear becoming engineers; rather they should understand engineering. 'For it is unquestionable that if architects fail to adapt themselves to circumstances, all but the decorative veneer of building work will come to be carried out by engineers to the disastrous decline of much that is great in architecture.' 130 In 1913 at the RIBA and AA he warned that 'a real living architecture' could not evolve if the designer of the building did not know construction, and if the practice of turning the design over to a constructional engineer, once the design was established, became prevalent. 131

Acceptance of American Architectural Design

Cubitt's argument was essentially the same as that of the Victorians for 'true construction' and architecture as decorated
construction. The only thing that had changed by his time was the technical complexity of design, which raised the question of whether a single person could perform the role of designer in the fullest sense that it had been known. Cubitt's concern extended deeper into the process of design than that of most architects and critics.

Architects wavered from the rigid stance of 1900, which called for the literal expression of steel frames. Perhaps this was due to the growing technical understanding of the need to protect steel. Certainly it was due to the growing appreciation of American architecture. The change from denigration to approval corresponded with the time that New York office buildings, rather than those in Chicago, came to the forefront of attention. The Beaux Arts display of New York buildings appealed to the British architects, then also casting appreciative eyes on the activities in Paris. Led in spirit if not in accomplishment by McKim, Mead, and White, New York architects brought the skyscraper into architectural acceptability. Featuring large scaled, classically based proportions and detail, the buildings were pre-eminent 'Grand Manner' designs. Their effect on British architects was to temper demands for 'truth' with cheers of accomplishment.

This enthusiasm for American design was marked by the awarding of the RIBA Gold Medal to Charles McKim in 1903. Criticism of steel framed construction showed signs of weakening as early as 1900 when the Builders' Journal published an article by a correspondent on New York office buildings. It considered the loss in structural ethics through the cladding of the steel frame was more than balanced by the gain in decorative effect. If there was anything the New Yorkers showed, it was that the steel frame didn't have to be literally expressed. The British press concentrated instead on the issue
of skyscraper proportions, and began to like what it saw. Broadway
Chambers was cited as an 'admirable attempt' at solving the propor-
tion problem. The Blair Building was 'a most skillful piece of
work.' By 1905 even Chicago office buildings like Sullivan's
Schiller Building were considered 'notably successful attempts.'
Interest and acceptance reached a journalistic climax toward the end
of the decade. Francis W. Swales wrote a lengthy, lauditory article
on American commercial architecture in the Architectural Review in
1908, tracing both historical developments and generic approaches to
facade treatment and proportion in New York and Chicago. He com-
mented on the 'remarkable growth of good taste and refinement' and
thought that 'many of these buildings are thoroughly successful as
designs.' Additionally he thought

there is in all of the recent work of architects -
the same clever reading of the programme, the same
scholarly solution, direct, simple, beautiful. There
is evident always an understanding of the fitness
of things; a desire to fulfill and not to avoid or
waive utilitarian requirements, and an apparently
healthy desire to eliminate the superfluous.

Swales's praise could only have been matched by the length of the
Builders' Journal's supplement on American architecture in 1909:
eighty pages of photographs and enthusiastic commentary.

New Interpretations of 'Truth'

If the demand for 'truth' in construction ceased to be a major
point of criticism of American architecture, it likewise lost some
of its strict literalness in Britain. Demands for 'truthful' ex-
pression of steel were heard less and less in the new century. By
1907 they had altered considerably. In response to Aitchison's 1903
Royal Academy lectures calling for the increased use of iron and
steel, but with a 'truthful' visible expression, the pragmatic
B. H. Thwaite outlined what, on technical and visual grounds, was to be the future of steel construction. Thwaite criticised the difficulties Aitchison had enumerated of steel construction as 'more imaginary than real.' He noted that a protective covering was necessary for the steel frame for fire-resistiveness, that the expansion and contraction coefficients of steel and concrete made them ideally suited to each other, and that the concrete would protect the steel from moisture and the likelihood of rust. Lastly, Thwaite pointed out that when these steps were taken to ensure the safety of the steel frame, the proportions of the supporting members would be acceptably within the range of Classical ideals.

It is unlikely that Thwaite's argument had much direct effect on architects. John Belcher's word, however, carried considerable weight. In his small introductory book of 1907, Essentials in Architecture, Belcher clothed the explicitness of Thwaite's aesthetic argument in echoes of nineteenth century 'truth' and stability. He argued that 'an engineer may be satisfied with the minimum of material consistent with strength and safety, but an architect has to see to it that a building is not only sound and good on the scientific and practical side, but also satisfies the spectator's sense of truth and fitness.' Belcher criticised both the steel framed buildings which obscured all of their structure through continuous solid walling, and the full plate glass shop front which made the building appear to be 'standing on a sheet of glass.' Only a metaphorical expression of the steel frame could have responded to Belcher's demands and at the same time avoided the pitfalls he outlined.

Ernest George, in his RIBA Presidential Address of 1906 argued it was a sham to give stone piers 'a comfortable width' when they enclosed steel. Victor Horsbrugh's Prize Essay of 1907 argued
essentially the same point. It is likely that the essay was a reasonable expression of the day: The Builder, in a reversal of its 1903 attitude (Statham was still the editor), commented that Horsbrugh had 'avoided the mistake...of supposing that architectural art is to be revolutionised by the new material and reduced to a metal architecture.' Horsbrugh argued that steel didn't influence architectural form merely because it was steel, and wouldn't until it had the durability of copper and the porosity and passive virtues of stone. In the meantime it influenced architectural form by the incidence of its enclosure and changed proportions, especially in terms of beam span relative to column height. He speculated that the steel frame with a veneer of protective materials would lead to an architecture of simpler planes, 'where the effort is sought in the general form of the massing and in the intrinsic beauties of the materials in a greater degree, and in moulded or sculptured forms in a less degree.'

Cubitt argued a similar line. He criticised those who advocated exposing and decorating steel girders as being ignorant of scientific principles, and argued that the encasement of steel with protective coverings closely following the steel form was both 'truthful' and scientific. Like Horsbrugh, he advocated decoration in keeping with the thinness of the enclosing material. He further argued that, instead of attempting to disguise the 'exact and scientific manner' in which modern structures were erected, they should 'accept the limitations of our position, and offer no resistance to the legitimate influence which our methods of designing and planning and our mode of construction must have on the formation of our buildings. Unstudied picturesqueness is out of the question.'

Whilst the issue of exposed steel construction was resolved by
this time, that of the appropriate expression of steel remained topical until the war. In 1912 The Builder was to maintain that 'the airy lightness of steel with the massive solidity of stone (was) the philosopher's stone of a modern style.'\textsuperscript{147} At the AA in the same year F. C. Eden argued a diminished need for the 'truthful' expression of the structural frame. He felt that, whatever material was being used, the natural conditions of gravity, weather, and light remained unchanged, and responses to these latter elements could not be expressed in ways wholly different from those of the past. In effect, 'truthfulness' in structural expression was only one of many considerations in architecture.\textsuperscript{148} Eden's point reflects a critical difference between the structural systems: heavy masonry bearing walls inherently tended to account for needs in the areas of heat loss, sound transmission and illumination, whereas 'truthful' expression of the full frame didn't. A conscious effort of compensation in non-structural aspects was required. Structure was no longer the primary motive in architecture: now it was one of many, often conflicting, motives.

At a conference at the RIBA five years later the principle of veneering was upheld. H. Kempton Dyson thought rich and variegated veneers were as 'truthful' as clothing on a human body.\textsuperscript{149} He further argued that the allowance steel made for greater intercolumnation had to be respected, as well as the large windows then felt to be so necessary for office buildings. Guy Dawber concurred on the legitimacy of the veneer and felt that 'there is no question that for commercial buildings we shall never return to the expensive, bulky walls and structures that we have long been accustomed to.'\textsuperscript{150}

By the war the principles had been fairly much agreed upon. Steel framed construction was theoretically legitimate. Direct ex-
pression of steel was not only stylistically unnecessary, but also illegal under the 1909 LBA. Architectural theorists were openly willing to accept changes in the proportions of building elements and were advocating a plainer, less embellished architecture. Finally, the functional and economic needs of office buildings, which had previously been denigrated or at best ignored, were not only accepted but embraced by the mainstream of architectural theory.

**EARLY FULL FRAMED OFFICE BUILDINGS**

The Ritz Hotel on Piccadilly, by Mewes and Davis in 1903-1905, is often cited as the first steel framed building in Britain, and the Morning Post, by the same firm in 1906-07, as the first fully framed office building. There were, however, several fully framed office buildings before the Post, as well as a number which employed the framing techniques for part of their external structure. They were by architects from the lower spectrum of the profession; significantly, almost no notice was taken of them by the architectural press. This is no doubt due to their being built before full framing was stylistically acceptable. The Builders' Journal, which, of the periodicals, had always shown the greatest interest in full framing, took the significant and popularising step in 1905 of publishing weekly progress photos of the Ritz. The Post later received similar coverage. The several full framed office buildings built before this splash of publicity suggests that the historical task of determining premier achievements may be impossible or at least tediously moot. What is certain about the Ritz and Post is that, as very visible demonstrations of both full framing and American construction techniques (the contractor for both was an American firm, the Waring-White Building Co.), they made the most lasting impressions.
One of the earliest full framed office buildings was the Royal Insurance Building in Liverpool. Designed in 1895 by J. F. Doyle, it was the winner of a closed competition over noted architects John Belcher, T. E. Collcutt, and E. W. Mountford. Norman Shaw was the assessor and, as recounted by Saint, largely responsible for the framing as built. Disappointed by the way in which Doyle failed to meet the brief's requirement of a column free ground floor public office, and in his placement of columns which were felt to obscure the natural lighting of the space, Shaw worked with Doyle to rid the space of the obstructions. 152 The office space extended across the fifty foot width of the site and was enclosed with side lit, external walls on two sides. (7-1) In the 1890's a fifty foot span would have been exceptional even in America, and the depth required for built up plate girders on the first floor or those above it would have encroached upon a building space that was restricted by 'Ancient Lights.' 153 The framing was further complicated by heavy chimneys at regular intervals on the floors above, loading each beam with 1240 tons. 154 Shaw's solution was closer to bridge structure than to building structure: slightly asymmetrical catenary trusses, each a full floor deep, placed through the second floor space on thirty-four foot intervals. (7-2) (7-3) From these, suspended members carried the first floor framing and diagonal chords projected upwards to form a platform for the third floor. Lateral bracing was provided by knee bracing at the first and third floors, a slight incline to the external wall columns between the first and third floors, and additional diagonal members within the fourth floor. All of these trusses were enclosed within the lateral walls of the small offices at the upper levels and were imperceivable in the finished building. (7-4)
External walls were likewise encased, but in brick and Portland stone. The trusses were not marked externally. The external walls were apparently self-supporting.

The building was almost completely framed in this manner. However, the southern bay enclosing the stair and lift shafts was built with traditional bearing walls. Problems developed with the rusting of the framework in the 1940's, which, in a sense, justified the fears of many of the steel frame's early critics. Poor detailing of the brick encasement had allowed rusting. The area most affected was at the base of the tower and along the cornice, causing a subsequent heaving of the Portland stone. The deteriorated steel was replaced with reinforced concrete. In light of Shaw's famous battles over the shop fronts of the Piccadilly Hotel, in which he adamantly demanded the truthful expression of his stone arches, this employment of hidden steel is very surprising.

Whilst the first segment of the Royal was nearing completion, what may be London's first fully framed office building was being built in the City. This building at 3/5 Rood Lane was built in 1899 as a small speculative office. It was as anonymous and practical as the Royal was showy and celebrated. The architect was City architect Edward Ellis; the builders were City specialists Trollope and Sons and Colls and Sons. The building was small, even by City standards, covering only about 2500 square feet superficial area. Its four storeys above the pavement were limited in number and height by 'Ancient Lights' easements across the twenty-four feet wide Rood Lane; its rear wall, with a stepped profile and glass roofs, has been noted. (2-91) A rather coarse Queen Anne facade was opened up to provide as much light as the regulations allowed. It seems as if this window requirement, plus the stepped profile at the rear,
provided Ellis with the stimulus to use the full frame. He took it farther than many architects subsequently, employing stanchions within the party walls to support the steel floor girders. (3-6) (7-5)

The walls probably remained from an earlier building. All but two of the primary girders were carried on cast iron stanchions, located either on the surface or just within, forming a flush finish. Thin concrete slabs encased small rolled steel joists in fire-resisting floors at all levels. The columns were all cast iron, and, as was standard in Britain, were cast in sections one storey high and stacked with joints just above the top flanges of the floor girders.

It was also standard practice at the time to minimise material by varying column design with respect to location and loading. Ellis used circular columns and cross, H and I shaped stanchions, in ten different variations for the small building. The columns had bearings of cast iron shoes, resting on stone slabs, with brick spread footings, another standard practice of the day. The external walls, by virtue of the size of their openings, were supported on the frame. 158

John Belcher's Electra House attracted considerable attention during its erection in 1901, but attention was directed towards the building's robust English Baroque stonework rather than the steel framing behind its facade. Shop fronts were situated along the Finsbury Pavement, and during construction it was decided that the rusticated granite piers were too small to safely carry the four storeys of wall above. Stanchions were hidden within the piers, and, to further stabilise the facade, they were run up to support the roof, floors, and walls above. Most of the rest of the perimeter was masonry bearing wall. When the details of the steel frame were revealed in a lecture at the AA, architects were particularly disappointed.
Trollope and Sons and Colls and Sons built another building with a partial steel frame the same year, a few blocks from Electra House. This was River Plate House on South Place. Richard Creed was the architect. The building was an unlikely application of full framing techniques; its thick walls with small windows would certainly have supported its five storeys. Creed relied on steel H shaped stanchions, with rolled solid steel columns at freestanding locations on the ground and basement floors. This was an early application of an expedient commonly used when absolutely minimum column sections were desired to avoid interruption of space and light. Foundations were done 'on the American principle,' with grillages of rolled steel joists encased in concrete. The steel structure wasn't complete, however; it was used only to carry the weight of the primary beams at external and party walls. The secondary members were carried on the walls themselves.

Just up the street from Electra House, another variation in full framing was built in 1904. It was for the London and Manchester Industrial Assurance Company, designed by Gilbert and Constanduros. The site, on the southwestern corner of Finsbury Square, partially spanned the Metropolitan Railway. This condition provoked the adoption of the frame. Concerned with irregularities of settlement adjacent to the railway right of way, the architects employed a five foot thick concrete raft reinforced with steel joists over the entire site. To minimise the weight of the building and, one would suspect, to tie it together, all floors were carried on a steel framework, independent of the self-supporting external walls. The facade of Cornish granite and Portland stone showed a Norman Shaw influence, but gave no indication of the steel frame beneath.
Caxton House employed still another variant in full framing. Built in 1905-06 to the designs of J. S. Gibson, this office building for a publishing company required windows as large as was allowed by the LBA. To accomplish this and assure the stability of the building, Gibson employed a full steel frame for the lower three floors. Above this, where the windows were smaller, the remaining four floors were supported by masonry bearing walls. All internal supports were steel stanchions. External expression again bore no relation to the steel frame. A rusticated two storey base of Portland stone was capped by red brick in a thin version of the English Baroque. The window area so eroded the base that it lacked conviction. Gibson combined the ground and first floors in arched openings with metal spandrels between, resulting in awkward proportions, and failed to develop any alternative focal elements to distract attention from the piers.

Three buildings in Glasgow were partially framed in another manner, but in response to differentiated lighting needs and with deference to visual stability. John A. Campbell's Edinburgh Life Association building and 84-94 St. Vincent St. utilised steel framed rear walls toward an alley, but masonry bearing walls faced with white freestone on the St. Vincent Street facades. A similar structural approach was adopted by James Millar on his Anchor Line building immediately next door to the Edinburgh Life in 1907. Millar covered his masonry front with Doulton's white Carrara, but framed the side and rear with steel. Both of these architects projected shallow glass-filled bay windows between their stanchions. Campbell's were more impressive due to their crisp white glazed brick facing and thin Hope's casements.

The most publicised full framed office building was the Morning
Post building. Designed and built by the same team as the Ritz, the building was the first office to employ both the full frame and complete American details. The external wall of the freestanding building was supported at each floor level by steel girders, including some exceptional curved girders at its 'flatiron' end. The Norwegian granite faced walls were built to the full width of the LBA requirement for bearing walls. With unexceptionally sized windows, they offered no hint of the full framing within. (7-9) The Builder thought that this was 'not the way in which anything great in architecture can be or ever has been produced.' A question raised by the building, never asked by the contemporary press, was why it used a steel frame at all. (7-10) With ordinary lighting expectations, no unusual loads (the superstructure was entirely for offices), and apparently no foundation problems, the only rationale could have been an unusual concern for structural integrity or a desire for minimising construction time. On the latter point, the building's sixteen month construction time was probably fairly common for a framed building of its size, but was a snail's pace by American standards, and could be matched by traditional British building methods.

With its publication of the Morning Post The Builder commented on the steel frame as being 'now so common.' Between the completion of the Post and the passage of the 1909 LBA, a noticeable number of full framed office buildings were built in London, despite the LCC's insistence that the external walls be built to the full thickness requirements of the 1894 LBA. Some of these buildings were completely framed, others only partially, employing the same techniques as those explored by architects before the Morning Post.

Of these, few approached the problem of steel expression in what
would have been considered a 'truthful' manner. Most architects ignored the issue. Arthur Bolton's Hamburg Amerika Linie building perhaps made a gesture, with frankly horizontal proportions to its plate glass fronted, ground floor general office spaces, and a surprisingly flat marble facing over the steel girder above. But the marble was cut and dovetailed to look like voussoirs of a flat arch.

(7-11)

Belcher's efforts in both the Royal Insurance Building (7-12) and Mappin House (7-13) were more significant. Perhaps stung by the criticism of his Electra House, or encouraged by the virtuosity and interests of his assistant John Joass, Belcher employed several approaches to the problem of 'truthful' expression. Both buildings were surfaced in Pentelikon marble, a material which had been an approved surfacing material since the polemics of G. G. Scott and Ruskin fifty years earlier. Both employed Mannerist vocabularies. These must partially be considered products of the era, rather than efforts at directly expressing the meaninglessness of Classical details on a steel frame, as Mannerism was applied by others to masonry buildings. Both buildings employed free standing columns with relatively wide spacing at the ground floor. They were, however, given traditional proportions by very different compositional techniques. In the Royal, the columns were expressed on the ground and mezzanine floors, but the actual floor line of the mezzanine was obscured by a dark metal covering. This tended to make the intercolumnation Classically correct for two storey columns. Belcher had to employ an unusually low head height on the mezzanine level to control his proportions and create a sufficiently strong entablature. It should be noted this was perhaps the first instance in which a London insurance office was enclosed by a blatantly open shop front. Previous to this,
insurance offices preferred massive walls similar to banks. The Royal management's tolerance for 'instability' may be as remarkable as Belcher's compositional solution.

Shops had never had such compunction; Mappin House is more extensively glazed. The upper level spaces were intended to be shops, offices, or warehouses; this was perhaps the programmatic stimulus for the facade treatment. As Henry Hill enthusiastically pointed out at the time, the jarring impact of Mappin House was due to its emphasis on the frame. Belcher placed two storeys of thin, straight columns and pilasters on top of two storey high columns. He terminated the ensemble with frankly thin arches. While resorting to the same material change as on the Royal at the mezzanine, Belcher maintained both Classical proportions and 'truthful' expression of the rest of his steel frame by carefully modelling its facade. The continuity of colour and texture was the key to maintaining visual unity.

POST 1909-FULL FRAMED OFFICE BUILDINGS

Belcher's virtuoso performances were usually difficult to surpass, and in office design this was true as well. The London Building Act revisions of 1909 gave establishment sanction to full framing, but in doing so altered the incentives and liabilities. For most architects the steel was merely a facilitator, and the decision to employ it was neither simple nor direct.

By 1909 the LCC had promoted its steel building act through Parliament. Referred to as the 'engineer's act,' it was almost wholly devoted to the structural calculations of the frame. The Act was as remarkable for its completeness as the earlier London acts were for their structural ignorance and omissions. It isn't likely that many
architects possessed the requisite knowledge to adequately perform structural calculations, making engineering cooperation a virtual necessity. As late as 1913 at the RIBA, A. E. Munby admitted ignorance in the structural issues of the act, and Reginald Blomfield, then president of the RIBA, confessed 'he did not know where he was' with steel frame design.

The chief feature of the 1909 Act was its allowance for reduced walls compared with the 1894 LBA. Brick walls could be made 8-1/2 inches thick for their topmost twenty feet, and thirteen inches thick below that. Stone facing added another four inches. Party walls, considered in joint ownership, were to be built to the existing schedules. Implicitly, they were to be bearing walls. Columns and stanchions in the external wall were required to have 8-1/2 inches of coverage of brick, terra cotta, or concrete externally, four inches on internal sides. Girders required a similar four inches of coverage, but edges of flanges could come within two inches of the surface. Internal structure required only two inches of coverage. The Act's lengthy provisions controlling the steel frame included, for the first time, floor live load requirements. For offices, these were set at 100 pounds per square foot. In the manner of the most progressive American practice, live loads on columns were allowed to be progressively diminished downward, to a maximum of fifty percent of the total superimposed load. Allowable stresses were established for girders and stanchions, while the design of both was additionally controlled by prescriptive rules. A process of approvals was established whereby the district surveyors were required to check all structural calculations.

Several months before the passage of the Act, C. V. Childs, one of the more experienced engineers in full frame design argued that
full framed construction would be a 'dead letter' within two years. Childs felt that the Act would increase the cost of steel framing. Secondly, architects 'like Mr. Norman Shaw' wouldn't desire to decrease the thickness of their external walls, and would opt to design under the 1894 LBA, he thought.

Childs was right on both counts. The long overdue Act had generally been expected to promote rapid and general use of the steel frame, but the results, at least in the first years, were the opposite. The Builder, using Child's exact phrasing, noted that popular opinion was calling the Act a 'dead letter.' The economics of a full frame was a subtle matter due to the heights of offices built in Britain. Prior to the 1909 Act the steel frame had an advantage over masonry walls by speeding construction time, allowing simultaneous work on all floors. As there were no regulations controlling them, design of the steel frame and determination of the loads was entirely at the discretion of the designer. Similarly, the internal fire-resisting frames were unregulated. These were often competitively tendered, with patentees supplying the steel girders as well as their fire protection.

The effect of the 1909 Act was to increase the cost of the steel in full framed buildings. One costly aspect of the Act was felt to be the approvals procedure: the time required for the district surveyor's review diminished the speed advantage of steel over masonry walls. More importantly, the stress limitations and load requirements required considerably more steel than would have been customary without the regulations. The resultant increase in cost eroded or eliminated the advantage offered by the thin walls. The 100 pound live load was considered extremely conservative. With an allowance for partitions, it brought the load on floors to 170 psf.
In contrast, competitive fire-resisting floors were customarily designed to 150 pounds total load. When considered separately, live loads were often forty pounds. Additionally, the allowable stress was limited to 7-1/2 tons per square inch by the Act, but in competitive fire-resisting floor systems, it was considered to be ten tons per square inch or more. Further discouragement built into the Act was the requirement that party walls be built to the 1894 LBA standards; in smaller buildings party walls could form most of the perimeter wall surface. Lastly, the 1909 LBA strictly regulated the fire-resisting encasement of the steel frame. Under the old LBA, economies could be gained by omitting or minimising the encasement. This was admittedly at the risk of fire, but many practitioners did not feel this to be very great in office buildings. Joseph and Smithen's London Bank of Australia, for example, built with a full frame in 1908, had unprotected columns and bottom beam flanges. One additional liability of full framed construction existed in the City. Laws of 'Ancient Lights' controlled virtually all decisions regarding building height and shape, and the office design and construction process usually involved threats, negotiation, arbitration and legal action. These might not be settled until construction of the lower floors was underway. In steel frame design the sequence of decisions progressed from top to bottom; subsequent modifications to the upper floors required modification to the steel design and fabrication of the lower floors' components.

Two years after the act passed, The Builder noted that it was used in only a small number of buildings. Some architects tried to circumvent the Act's influence by attempting to gain approval of full framed buildings built with walls of the thickness required by the 1894 LBA. Their argument was that the 1909 LBA was optional, and
if the walls were of the 1894 thickness and could potentially support the building, the 1909 provisions wouldn't apply. Oscar Faber thought it 'a matter of national concern' that the act was a popular one, considering the value of City land and ground rents. The Builder offered a stylistic criticism, calling it 'contrary to the canons of art' to build a thick wall when the hidden structure allowed a thinner one. As interpreted by legal counsel, and administered by the district surveyors, the Act became compulsory if a full frame was employed.

The office buildings built between the passage of the act and the war showed as great a range of framing approaches as before the act. They offered evidence of the subtleties of full framed economics, and indicated a reluctance to meet the hopes of the progressive theorists in recognising and expressing the frame's structural role. The decision to employ a full frame was related to a variety of issues, few of which have been recorded for specific buildings. The cost of the framing, cost of land, savings in wall thickness, and length of construction period all entered into it. Whilst it is probably certain that the full frame offered the clearest advantages to large buildings and fewer advantages to small buildings, examples can be cited at both extremes that counter this general rule and underscore the subtlety of the factors involved.

T. E. Collcut and Stanley Hamp employed a full frame in their extensions to the P & O Offices in 1911, a building only four storeys high and covering just 2400 square feet. In the same year, however, their nine storey, 22,500 square foot Thames House on Southwark Bridge was built to the 1894 LBA. Dunn and Watson's extension to the Scottish Provident Building, comprising seven storeys, was also a brick structure. William Dunn might have been expected
A frequent lecturer on new structural techniques, he co-authored one of Britain's first books on reinforced concrete. In a 1911 office building for the long established City of London Real Property Company, Charles Reilly employed the same strategy as John S. Gibson had five years earlier on Caxton House. Reilly's eight storey building employed a full frame for its lower six floors, but the upper two were bearing wall supported. Perhaps the most striking example of the subtleness of the issue is offered by India and Empire Houses, finished in 1915 on adjacent sites where Kingsway terminated in the Aldwych. Both buildings were designed by the progressive commercial architects, Trehearne and Norman, and built by the same builder, William Taylor and Co. The sites were approximately the same size, and both buildings reached eleven storeys, the full limit of the building regulations. India House, facing Kingsway, employed a full frame, while Empire House, on the corner, was built with masonry external walls under the 1894 Act. The only apparent justification was that Empire House's greater perimeter of party walls favoured the earlier act.

Full framing was, however, increasingly taken advantage of. For all the hopes and fears it generated concerning the thickness of external walls, few architects seem to have taken advantage of its allowances. In the City W. Campbell Jones's Hong Kong and Shanghai Bank on Gracechurch Street had three foot thick walls at the ground floor. London House, a speculative building designed in 1912 by William Clifton, had two foot thick walls at the ground and first floors. 17 St. Helen's Place, by leading City office architect H. Chatfield Clarke, had walls two feet, six inches thick at the pavement. In Westminster similar wall thicknesses were evident.
minster House by Gordon and Gunton, built in 1914, employed three foot thick walls at the ground, decreasing to two foot above.\footnote{202} Empire and India Houses (6-13) (7-14) employed identical wall thicknesses at their front and area walls, with the only difference in thickness at the window sills, where the 1909 Act allowed reduced thickness for India House.\footnote{203} Even John Burnet's Kodak House, (6-64) (7-15) often cited as an early example of steel framing expression,\footnote{204} had walls almost three feet thick on the ground floor, and only slightly less on the first.\footnote{205} Charles Heathcote's 1915 Lloyds Bank in Manchester (7-16) employed three feet, two inch thick ground floor walls, plus columns projected into the banking hall. Most of the dimensions of these buildings were as great or greater than would have been required by the 1894 LBA.

On some buildings, such as Jones's Hong Kong Bank, wall thickness was achieved with falsework to completely enclose the steel columns, which otherwise would have projected into the interior spaces. A clever utilisation of the heavy wall was shown by M. E. Collins in several City buildings. He hollowed his walls with circular vertical shafts at regular intervals, each of which provided gravity ventilation shafts for the perimeter offices.\footnote{206} A common treatment was to build a heavy ground and perhaps first floor, with thinner walls above, aligning the inside faces of the walls on each floor. The residual space on the exterior was then filled with pilasters and columns, balconies and sculpture, which might be two feet deep without transgressing the building line, and which added to the plasticity, shadow, and apparent depth of the wall. Gordon and Gunton employed this on their Royal Insurance Building in the City, and on their Chartered Bank of India, both in 1911.\footnote{207} Thompson and Walford did the same on their Ocean Marine Insurance Building in
If these buildings indicated their architects' and clients' reluctance to let go of their fifty or sixty year old stylistic foundation, they also showed an equal reluctance to wholeheartedly express the steel frame in elevation. Burnet's Kodak building was an exception, but it represented as much the culmination of Burnet's interest in American architecture as it did the 'American principle' of framing. Others exhibiting similar influences were F. W. Troup's Blackfriar's House in the City, (6-44) and W. A. Thomas's Tower Buildings. (6-34) Trehearne and Norman were perhaps the only commercial architects who were committed to the expression of the frame, although in their case it was as much a reconciliation to the demands for natural lighting as it was to the idea of expressing the frame. If Burnet in the Kodak effectively expressed the verticality inherent in the steel frame, Trehearne and Norman expressed the column spacing at a scale appropriate to the 100 feet wide Kingsway and their buildings' eighty feet high facades. (7-14)

These buildings, however, were exceptions. Despite the concern of the theorists, offices were a poor vehicle for the application of progressive stylistic ideas. Office building design in general always followed leading design developments by several years. Up to the war, most offices continued to be designed in a robust English Baroque. The models explicitly eliminated expression of the steel frame.

This was probably a reflection of clients' demands, as office building architects seemed always to provide clients with what they wanted, and architectural ideals always required time to gain public acceptance. The influence of the full frame in British office buildings of this period was to be chiefly relegated to the areas of build-
ing cost and construction speed, and not stylistic expression.

**CONCRETE FRAMING**

The extended controversy over steel framing was never really directed toward the other new framing system, concrete. The reaction instead is best described as one of caution. Concrete had been used since the early nineteenth century, and had regularly been employed in patent 'fireproof' floors, but its use in full framed structures did not occur until 1899, when Hennebique's system was used for a wharf in Woolston. Concrete's acceptance was hastened by numerous industrial applications throughout the country, but not in London.

**Concrete in London**

The government was cautious. A 1907 ruling by the Local Government Board discouraged concrete usage by restricting the loans to local authorities for concrete buildings. The material had not been proven over time, it claimed. When the 1909 LBA was passed regulating steel construction, it also enabled the LCC to establish concrete regulations after the issue had been sufficiently studied. The RIBA had been instrumental in supporting this caution. Its study committee reported on concrete in 1907, and continued to study the matter until 1911. It was not until 1913 that the LCC prepared a draft, and 1916 that concrete regulations were enacted. Coming into effect just as the war was stopping office building construction, the net effect of the extended study period was to regulate concrete out of London.

Ironically, whilst some government agencies postponed the use of concrete, other agencies were building with it. Sir Henry Tanner's General Post Office Extension, 1909, is fairly well known.
buildings included the Metropolitan Railway Offices on Baker Street, a project designed by C. W. Clarke with the Coignet system in 1912, and the Offices of the Board of Agriculture, Whitehall Place, designed by H. A. Collins and built on the Hennebique system in 1914.

There were perhaps only two privately built, concrete framed office buildings in London in the first quarter of the century. The first of these was the Commercial Bank Building, a large curved block at the bottom of Gracechurch Street, (7-17) designed by F. R. Gould Williams. The foundations were started in 1914; construction continued through the war. The other building was 299 Oxford Street, designed by experienced office specialist, Delissa Joseph. The seven storey building had been designed in steel, but at the order of the Ministry of Munitions, the frame was changed to concrete.

When the war ended, the favourite building methods for offices were unchanged: brick bearing walls or steel frame. Concrete was said to be cheaper than steel, but took longer to build. On expensive sites where time was a major factor in building, this may have been a decisive factor.

The major use of concrete in London, as in the rest of the country, was in 'fireproof' floors. If the concrete patentees were frustrated in not receiving approval in London for full frames, they should certainly have been pleased with the general application of their products in floors.

Hennebique had a floor system. So did the other major French company, Considere. This latter system was used in London at the Royal Insurance, Lombard Street, and Westminster House, both designed by Gordon and Gunton. Among the other systems in use in London were the Kahn, Oscar Faber, Stuart's Granolithic, Columbian,
British Fireproof Construction Co., and the Diespeker Big Span. The most popular, apparently, was Kleine Floors, (7-18) a system which employed hollow bricks as formwork resulting in a flat beamless ceiling which maximised the spread of light. It was employed by Burnet at the Royal Insurance, M. E. Collins at the London and Lancashire Insurance Co. and Queens House, and H. Percy Moncton at the Pearl Assurance, among others.

Far more interesting, however, and more important was the use of concrete for full framed offices. Several were built outside of London in the early years of the century.

Concrete in the Provinces

The application of the full steel frame to office buildings was uncertain. No single factor demanded its use. No pattern of use can be related to building size or location. Although there were fewer examples of concrete frames in offices, there was considerably more logic discernible in their application.

One of the first applications was the annex to the Dundee Courier Building, Dundee, designed by the London firm Niven and Wigglesworth in 1906. The lower floors of the building housed heavy presses with offices above. The Stuart's Granolithic concrete was used for the complete frame. (7-19) Its Neo-Classic exterior gave no hint of the frame. A similarly sized building was built in Leeds to the designs of C. D. Martin of London, and S. D. Kitson, a prominent Leeds architect. Although the explicit motivation for its Coignet concrete frame was not defined, the architects pondered the expressive problem of the building. They chose a 'terra cotta exterior until a suitable concrete expression was found. 230 A practical, almost industrial, concrete office was built with the Considère
Concrete's great efficiency allowed considerably thinner walls than brick would have required. Cackett and Burns-Dick designed the Cross House in Newcastle with a concrete frame. The Portland stone faced walls were only 12 inches thick. A far more convincing expression of the advantages of concrete was Lyon Chambers by Salmon and Son and Gillespie, built in Glasgow in 1906. This building, surely one of the more remarkable Edwardian office buildings, featured an expression as unusual as its framing. It soared to ninety feet on a site no greater than forty-three by thirty-three feet. With the four inch thick floors of the Hennebique system, the architects were able to build nine lettable floors, including the basement. The walls, however, were the key factor in the success of the building. They were only four inches thick. Had they been in brick, the Glasgow Building Regulations would have required those of the lower floors to be thirty-nine and a half inches wide, which would have made the offices too small for rental. Unfortunately Lyon Chambers had no real followers. Such ruthless efficiency was not generally appreciated anywhere, except perhaps in the City. It may be that its roughcast exterior limited its admiration in other parts of the country.

The other ideal application of concrete in offices was in very large buildings. The two most significant large concrete office buildings have already been noted for their formal qualities: the Royal Liver Building and the Cunard Building, both on the Pierhead in Liverpool. Soil conditions were extremely poor; concrete could be built with less weight than brick. It additionally offered greater structural rigidity and faster construction.

The Cunard Building, designed by Mewes and Davis, with Willinck
and Thickness as local architects, was the larger of the two. (6-35) 

(7-22) Covering over 100,000 square feet of ground area, it contained over twenty acres of floor space within its nine floors. The concrete was by the Trussed Concrete Steel System. Ground-work was started in December 1912. One of the few office buildings not stopped by the war, it was completed in June 1916.

The Royal Liver Building, although considerably smaller at about 360,000 square feet, was taller. Designed by Aubury Thomas, it was the tallest office building in the country when completed in 1910. The main roof was 170 feet above the pavement; the towers rose to 290 feet. The Hennebique framing system allowed the building to be built in only three years, and saved twenty-five percent of the cost of building in brick. Thin granite curtain walls were entirely supported by the frame, thus allowing enclosure simultaneously at the ground, third, and seventh floors. (7-23) The system allowed considerable flexibility in establishing the building profile. Thomas subtly stepped back the first, fifth, and ninth floors, (6-33) which established a sense of repose. Additionally, in a structural gesture achievable almost solely in concrete, he carried the twin towers on vaulted girders spanning sixty-five feet at the ninth floor. A typical floor shows no evidence of the towers. (7-24) Such bravado would have been unheard of with brick. It also could hardly have pleased advocates of 'truth in construction.'

Those architects that were willing to work with concrete seemed unwilling to probe the expressive issue. Only Salmon and Son and Gillespie took on the challenge. Little Lyon Chambers, with its flat roughcast walls, remains the most 'honest' concrete office built before the war.
CONCLUSION

The fast paced technological changes in structure, and attitudes to structure, in the early twentieth century have to be considered among the most important developments in the office building evolution. Threatened by the American steel skyscrapers, and challenged by the French concrete patentees working on British soil, traditional philosophy took a resounding beating.

Most of the real changes occurred between 1905 and 1910; only experience through continued building was left to be gained. The two major objections to the new framing systems had been fear of deterioration and challenges to style. The years up to the war confirmed the former. The latter issue, style, was never really probed again until well after this formative period ended.
EVOLUTION OF SERVICES

HEATING & VENTILATION

1840 1850 1860 1870 1880 1890 1900 1910 1920

Open fire as preferred method of heat & vent.

Central heating preferred

Practical & theoretical problems

Beehive stove

Perkins high pressure hot water

Phipson hot air

Burner vents, sunburner

Contagion theory

ARTIFICIAL ILLUMINATION

Candles

Gas burner

Incandescent mantle

Incandescent lamp

1/2 watt lamp

308
CHAPTER 8
EARLY TWENTIETH CENTURY SERVICES:
INTEGRATION OF MODERN SYSTEMS

The characteristics which made the twentieth century office building so completely different from its Victorian predecessor extended to include building services. Whilst the Victorian building was lit with gas, the Edwardian building featured electric lights. The Victorian office relied on the open fire, but this became merely decorative, a sign of status, as the twentieth century office became routinely warmed by central systems. The major changes in systems occurred with little notice between the years 1895 and 1905. Additional technological refinements in the years up to and through the war further served to intensify the contrast between the office buildings of the two centuries.

ARTIFICIAL LIGHTING

Natural lighting design was among the most important factors in the office building evolution, a continuing requirement in both Victorian and twentieth century buildings. The dependence on natural lighting, however, did not diminish the need for supplementary artificial lighting, especially on short winter days. Available natural lighting varied considerably throughout the day. One measurement, taken in a 'well lighted' London office, showed available natural light at noon to be twenty times that at 9 AM. (8-1) Even as late
as 1919, in modern large windowed offices, artificial lighting was considered necessary for three hours each winter day. By then good quality artificial lighting in offices was not difficult to achieve, but twenty years earlier, and certainly in Victorian buildings, it was a rare commodity.

Victorian office lighting had a concise evolution. A brief outline is appropriate to underscore the radical changes of the twentieth century. Gas lighting, the staple of the Victorian office building, was first employed in factories, mills, and collieries at the beginning of the nineteenth century. Offering more light with the safety of a fixed burner, it slowly gained acceptance over the candle or lamp. The earliest usage of gas in offices is unknown. The Bank of England, perhaps representative of the attitudes of bankers and businessmen, cautiously waited until 1843 to install gas burners in their offices. Cockerell had to reassure the directors that gas was safe. The Builder noted as late as 1864 that candles and oil lamps were still in use in some City banks.

Information regarding early gas installations in offices is very uncertain. The ventilated pendant fixture and the sunburner, already discussed as aspects of ventilation, were available from about 1850. Non-ventilated pendants and wall mounted burners were also available. Another fixture, used to supplement the sunburner in large offices, was the desk mounted upright fixture. It probably came into use in the 1860's. As installed at Backhouse and Co. bank in 1871, for example, each lamp was shared by two clerks. A similar arrangement was employed by Gibson at the National Provincial Bank in both the head office, and later at the Piccadilly office. These examples probably cover the extent of gas lighting in offices. The degree to which these fixtures actually provided illumination is un-
certain, since a photometer for measuring ambient light was not available until the turn of the century.

The gas burner unfortunately 'vitiated' the air. A salvation to the pollution problem came with an electric light suitable for office use. Swan and Edison simultaneously invented the carbon filament incandescent lamp in 1880. Parliament passed the Electric Lighting Act in 1882, allowing private companies to generate and distribute electricity. The next twenty years, however, remained years of gas lighting. Electric lighting was slow in gaining acceptance. It was expensive and the public had to overcome fears of fire safety. The electric companies had difficulties in organisation. Even as late as 1890 there were no companies serving the City.

From the outset both AC and DC current were distributed, with little coordination between companies serving adjacent districts. If distribution was not available, a steam engine was needed to produce power. Office companies, reluctant to provide steam engines to power lifts, were just as reluctant with electricity. In addition, early electric lighting was troublesome. Carbon filaments were fragile. Service was uncertain. To minimise service loss, fixtures were fitted for both electricity and the more reliable gas, as in the Yorkshire Banking Co.'s head office. Perhaps most important, electric lighting cost more to operate than gas. Bulbs were expensive. Their brilliance required shading, which cut illuminating power thirty to sixty percent.

Whilst popular belief maintained a substantial cost difference, one authority, W. H. Preese, in 1891, believed it to be as little as ten percent. This difference changed dramatically over the next fifteen years. Gas lighting got substantially cheaper with the in-
roduction of the incandescent gas mantle. Introduced in 1886, the mantles were in common use by 1898. Called a 'revolution in lighting,' they produced four times as much light at one third the gas consumption as the old fishtail burners. Various sources claimed that filament electric lamps cost from two to five times as much to operate. Changes in electric technology around 1910 then made it as cheap as the gas mantle.

Despite the problems, the electric lamp enjoyed slow but steady acceptance in offices. Perhaps the first office installation was for the Anglo-American Electric Light Company in 1881. Others followed in 1883: the Royal Courts of Justice Chambers featured 200 lights, and the National Provincial main office was also wired. Both of these installations required steam engines and storage batteries. Few others were noted by The Builder until after 1890, when a succession of installations in offices were reported. The increase in installations coincided with the placement of the distribution systems. In 1893 The Builder noted the majority of large buildings were 'fitted up' for electricity. Electric installations soon became so common they ceased to be noteworthy.

By the turn of the century there was little question of the preference for electric lighting. The Midland and City Bank routinely installed electric lighting in its various branch offices after 1903, as did the Lloyds Bank after 1900. The enthusiasm for electric lighting was unprecedented for any other technology. New office buildings typically boasted of the size of their installations. The Electra House claimed over 1000 lights and seventeen and a half miles of wire. The Cunard Building in Liverpool, one of the largest offices in the country, exaggerated its claim by counting the length of wires if separated, and boasted fifty miles of wire.
Incandescent electric lighting installations in offices followed the same pattern established by gas burners. Strode and Co. offered a range of pendant mounted fixtures. (8-4) Smaller offices, such as in the Phoenix Assurance Co., were served by adjustable ceiling lights. (2-28) (2-29) The National Provincial head office electric installation was probably typical: existing desk mounted gas burners were wired for electric lights. Lamp placements on desks, such as in W. Campbell Jones's London and County Bank, 1907, became quite common. (8-5) Typically lighting fixtures were placed very close to the work surfaces, with each lamp serving only one or two clerks. The carbon filament lamp produced illumination sufficient only for local lighting.

One notable exception to this general approach was the 'novel installation' in the Union Bank of Australia, 1896, by Goymour Cuthbert. The design featured twenty-four suspended bronze dishes, each with carbon filaments within, washing the ceiling and providing shadowless, reflected indirect lighting. The Builder thought the effect was 'distinctly good.'

Ironically, the general adoption of electric lighting in offices in the 1890's occurred at a time when no significant improvements were being made in lighting technology. After the turn of the century, however, lighting technology advanced with a rapid succession of improved lamps, and by 1909 the fragile, expensive carbon filament lamp was as obsolete as the gas burner. The first improvements came in the form of metallic filaments, osmium, tantalium, and tungsten, which were brought on the market between 1902 and 1910. These lamps, all more durable than the carbon, operated at one-third to one-fourth the cost, and could be made with up to twenty times the power. The second major improvement was the gas filled lamp.
Introduced in 1913, it was often called the half-watt lamp, because it required only one-half watt per candlepower. Available in as much as 3000 candlepower, the gas filled lamp's great efficiency made adequate lighting economical, and hastened the arrival of innovative general lighting concepts.

Lighting, both natural and artificial, had always been highly subjective due to the lack of a practical method of measuring reflected and ambient light. In the first decade of the century, however, portable photometers became available, enabling measurement of lighting effects and the setting of standards. Surprisingly, the standard for offices was relatively low. In 1907 an office was believed to require two to three foot candles on the clerk's desk. A living room at the time was thought to need three to five and a ballroom eight to twelve. The office requirement was increased to three to five by 1919, although at least one expert recommended as much as six or eight foot candles for close work, such as in ledgers.

The enthusiasm for scientific office management, which had led to the open office plan, functional furnishings, and the idea of production efficiency, was extended to lighting design. It was argued that 'defective lighting necessarily handicaps the worker, and tends to restrict output and prejudice quality of work.' The difference in cost between good lighting and bad lighting was noted to be generally less than one percent of clerical wages. One percent of the day amounted to five minutes. 'There could be no question therefore that the better volume and quality of work saves not five minutes per day but many times this number of minutes.' The most economical argument was made in the *Illuminating Engineer*:

To knowingly require man to labour under conditions which require a greater amount of energy than is
necessary is a transgression of moral law as well as economics. Poor or insufficient light is indefensible from every standpoint. Let us not overlook the fact that we work by sight; that we see by light. Let us have more and better light.40

With attitudes such as these, and technology steadily improving, it is hardly surprising that office lighting underwent more changes in the few years surrounding the First World War than in the preceding seventy-five years.

Local lighting, utilising the desk top or pendant lamp, had been the only viable method of artificial lighting with the gas burner or carbon lamp. This was supplemented and in many cases succeeded by the concept of general lighting around 1910. In small offices or managerial spaces of large offices, local lighting remained in favour because of its economy and its decorative possibilities. In the large open plan offices, however, particularly in banks and insurance companies, general lighting offered several advantages. Lighting ideals of scientific office management called for no severe contrasts, few reflections from polished surfaces, no shadows, easy to clean fixtures, economy in installation and operation, and ease of control.41 Local lighting offered very few of these qualities. Additionally desk mounted lights were easily damaged by ledger books, were shaken by typewriters, made it difficult to arrange furniture, and lit the bottom portions of ledgers unevenly.

General lighting was installed in offices from about 1910 following initial development in America.42 It was available in direct, indirect and semi-direct systems. The last type combined aspects of the first two. Installations received a major stimulus with the introduction of the powerful gas filled lamp, which required diffusers or shades but offered the economy of relatively few fixtures.43 By 1915 it was noted that local lighting, 'once universal,
is gradually being replaced and there seems to be good ground for
thinking that general illumination will do all that is necessary.44
By 1919 general lighting was claimed to be accepted as the most suit-
able system for offices of all kinds.45

Despite the gains made in lighting quality and office space de-
sign with general lighting, artificial lighting was still typically
regarded as a supplement to natural lighting.46 One challenge to
this basic tenet was published in the Illuminating Engineer in 1916.
F. W. Willcox, a prominent lighting engineer, outlined the position
of the provocative American engineer, M. Luckiesh, who claimed that
artificial lighting was more economical than natural illumination.47
Luckiesh's calculations took into consideration the loss of revenues
from 'nonproductive' light areas. This logic was an expression of
attitudes in America, where office buildings were built with floor
depths greater than those accepted in Britain.48

Several buildings showed this logic in their plan arrangements.
Deep office spaces were discussed earlier in Twentieth Century Form.
Bush House, for example, was sixty-five feet deep. It was intended to
have windowless offices. (6-15) Adelaide House, (6-17) had spaces
that extended thirty feet from a window. Portions of their office
spaces, such as Thomas Tate expressed in his stylised, cool perspective,
(8-6) could not have been anything but totally artificially lit. The
depths of these buildings proved to be anomalies, however, as concern
for natural illumination never subsided. These buildings do repre-
sent, nevertheless, a natural conclusion and built expression for the
almost universal enthusiasm for general lighting.

CENTRAL HEATING

One last building component remained to be integrated before the
open office could become reality: central heating. The suspicion, caution, and outright abhorrence of the Victorians toward central heating changed dramatically in the few years following the turn of the century. The change in attitude was related to improved technologies, revised medical theories, a growing appreciation of 'warming' and ventilation as executed by the Americans, and the larger offices demanded by scientific office management.

What had been complete admiration for the open fireplace changed to only selective appreciation or outright denigration. The Builder had called the love of an open fire an 'instinctive...appreciation of scientific fact,' whilst criticising American steam systems in 1896.49 By 1902 it claimed 'the American practice of warming and venting an entire (office building) is infinitely to be preferred to the haphazard methods prevailing in this country.'50 Over the next two decades the fireplace was routinely criticised as being too local in effect, too wasteful of fuel and labour, dirty and unattractive. Additionally, fireplaces took up valuable office space, and made it difficult to achieve an open plan or subdivide to tenant needs.51 The Architects' Journal summed up attitudes in 1922: 'A fireplace is a very bad tenant utilising valuable floor space but paying no rent.'52

The fireplace had always been valued for its ventilating power, but this value diminished around the turn of the century, as the miasmatic and limited contagion theories of disease were replaced by the strict contagion theory. Bacteria was recognised as the cause of disease. A leading theorist and most active proponent of the new theory was Dr. Leonard Hill.53 By 1911 his arguments had become the mainstream of thought: CO₂ (as carbonic acid had come to be called) was irrelevant as a measure of disease. There was no connection between comfort and health. Odors in a room might be unpleasant, but
they merely indicated the degree of ventilation, not the degree of life safety.  

With the new theory, the ventilating power of the fireplace was no longer of such critical value. The popularity of the fireplace as the first choice in heating began to be questioned several years earlier, however, near the turn of the century. The challenge came from an improved technology for low pressure hot water central heating, the favourite mode of the various forms of 'artificial' heat. The improvements were largely borrowed from American experience.

The various editions of Hood's *Treatise on Warming Buildings*, edited by Frederick Dye, chronicled the technological changes. In 1879 it was noted that twelve to fourteen feet of four inch pipe was required to warm 1000 cubic feet of space. The 1891 edition reinforced the century-long complaint that pipes such as these were objectionable for their unsightliness and because the horizontal surfaces collected dust, causing an offensive smell. Additionally, it revealed a basic distribution problem: for tall buildings such as a typical office building, two or more boilers placed at intermediate levels of the building were felt necessary to protect joints and fittings from excessive pressures.

By 1897, however, Dye reported 'much greater demand for central heating than has ever been experienced in this country before.' Most of the popularity was attributed to the new radiators, either American or designed on the American principle. Radiators, or coils as they were often called, had been available in Britain for years, but, like the unsightly pipe, they were designed with horizontal pipes. (8-7) American radiators were fundamentally different; they had vertical pipes which remained dust free. Furthermore, their surfaces were decorative castings. Dye was unequivocal: 'In manu-
facture the American radiators are as perfect as can be had. 59  
'They are certainly educating the English people to an approval of hot water work that they never had before.' 60

Whilst the radiator may have improved the appearance and hastened the acceptance of central heating, improvements in distribution were necessary as well. In addition to the problems of pipe size and limitations on the number of storeys served, low pressure gravity systems were slow in delivering heat, and could become severely constrained with bends or drops required to clear doorways or other obstructions. The solution to all of these problems was to accelerate the water. The common methods were steam injection, or propulsion by electric, steam, hot air, a petrol engine, or even water power. 61

Among the earliest of these was the Reck steam injection system, patented in 1899. (8-8) Others, including the Gould, the Hyflo, the Pulsial, the Holden and Brooke, the Beeston, and the Barker, came on the market in such rapid succession that The Builder commented in 1912 'Now every morning's post brings...a description of a new system of heating, each claiming to possess advantages not belonging to any other system.' 62

Whilst it is difficult to determine the extent of use of either low pressure or accelerated hot water systems from the limited notice given by the journals, it is safe to conclude that these water based systems were more popular than others. The largest office buildings must have relied on accelerated systems as the Cunard Building did, 63 but some relatively large buildings, such as H. Chatfield Clarke's 17 St. Helen's Place with seven storeys, had low pressure. 64

Water based systems were not the only ones in office use. Steam systems, the most common in American skyscrapers but little appreciated in Victorian Britain, were reasonably popular. Atmospheric
steam was claimed to be 'an ideal apparatus for the heating...of office buildings' in a paper delivered to the Institution of Heating and Ventilating Engineers in 1909 by John Watson. He had designed the system in H. Chatfield Clarke's Caxton House. (8-9) Among its claimed advantages were small pipes, quiet operation, individual control of radiators, 200 degree maximum radiator temperature, and thermostatic control to within one degree.65 Steam was used as well in John Belcher's Electra House and in Gordon and Gunton's Westminster House.66 Both of these buildings additionally employed the plenum system. More common for public buildings than for offices, the plenum system relied on heated, pressurised air distributed through ducts. A considerable controversy surrounded the plenum system around the turn of the century. Claims were made that its heated, pressurised air was less healthy than that of 'natural' systems,67 but it was often used for large public offices of banks and insurance companies. Like many other buildings, Electra House (8-10) and Westminster House employed the system only in large spaces with many clerks. They relied on simpler radiator systems for the other spaces.

It is difficult to ascertain the extent of use of any particular central system in offices, but there is no doubt about their growing popularity in the first decades of the century. The record of office buildings built by Trollope and Sons and Colls and Sons may be representative of more than just the City. Of the ten offices they built between 1900 and 1910, five employed full central systems, and three relied entirely on fireplaces. In the next ten year period, however, twenty-three of the twenty-five offices built had central systems; only one completely relied on fireplaces.68

This unmistakable swing away from fireplaces must have enhanced, and been stimulated by, open office planning, but it simultaneously
removed the traditional method of ventilation. A common replacement consisted partly of fresh air intakes below windows. Initially this was done behind the radiators, (8-7) but proved difficult to clean. By 1913 the problem had been solved by placing the intake below the radiator, which was wall mounted to facilitate cleaning. 69

Extraction was handled in several ways. Some buildings, like M. E. Collins's London and Lancashire Life, 1913, continued the old practice of gravity extract flues, but without the adjacent fireplace flue. 70 For larger, open spaces, this method must have been limited in its effect. The other method, seen as early as 1912 in Collcutt and Hamp's P and O Extension, 71 gained increasing favour over the next ten years. 72 It consisted of extract ducts in the corridors connected to roof mounted electric or centrifugal fans. (8-11)

The fireplace was never appreciated by advocates of scientific office management; with central systems it was not necessary. It continued, however, as a standard component of office design. With its role changed from basic necessity to an expression of status, it became restricted to the board room or the manager's office. The fireplace was, as one architect put it, 'for artistic purposes.' 73 In an era of open planning and increasing concern for efficiency, the placement of even a few fireplaces was not without problems or restrictions. In the Cunard Building the architects were reluctant to build the required flues, which would have 'necessitated alteration from the simplicity of the plan...characteristic of the building.' 74 The solution was to serve several fireplaces with a single flue, powered by an extract fan on the roof. As an added measure, the air was cleaned by a horizontal chamber on the roof, collecting the soot from all the flues before releasing the air to the atmosphere. This

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was perhaps the most sophisticated effort to gain the aesthetics of a fireplace in a large office building. The more common approach was simply to restrict the locations of the fireplaces. Architects realised that the required thickness of the party walls allowed for a complete fireplace and chimney system with no loss of internal floor area. This must have worked well with open office planning, for the smaller managerial offices were invariably along the edges of the plan. The Empire and India Houses (6-12) showed how simple this approach could be. It was used as early as 1909 in the City, in the Union Bank of Scotland, and by 1914 was common.  

CONCLUSION

With the advent of central heating as the new standard and the fireplace elevated to an 'artistic' role, the heating of office buildings had drastically changed in less than twenty years. When considered with the developments in lighting technology and the introduction of general lighting, it is apparent that the modern era for office services began in the years leading up to the First World War. Such major change in so short a period is extraordinary. There can be little doubt that these changes in services were encouraged by the overwhelming rationale of scientific office management, which in itself was producing instrumental changes in office building planning. With the concurrent changes in building structure and the fundamental changes in style, the years leading up to the war were almost revolutionary.
Stylistic attitudes underwent considerable change around the turn of the century, and with them, attitudes toward street architecture and office buildings changed as well. As early as 1890 Alfred Waterhouse had criticized the 'smallness of parts' and the 'picturesque' characteristic of the later Victorian architecture. He called for 'grandeur.' By Edward's reign this criticism had become general. The 'monotony of small and usually over-elaborated ornament' with 'scarcely any plain space as a repose for the eye' was replaced by a variety of stylistic ventures, all of which offered 'greater breadth of treatment.' The term for the changes in attitudes was 'Grand Manner.' Advocated most consistently and eloquently by Reginald Blomfield at the Royal Academy, it was an attitude shared by many of the most influential professionals, and echoed with varying degrees of conviction by their followers.

Office buildings were highly reflective of these changes. They became accepted as important components of the newly emerging practices in street architecture. Edwardian Britain held a vastly different attitude toward commercial activities than Victorian Britain. Earlier only the banks and insurance companies had been culturally appreciated as business enterprises; now a full range of commercial
activities was embraced, and offices were regarded as appropriate expressions of power and prestige. As Beresford Pite acknowledged in 1902, there was the 'joyful acceptance of current requirements' of business. There is perhaps a relationship between these new cultural attitudes and the entry of the best practitioners into the office field. Consequently, for the first time offices entered the centre of the stylistic arena. Whereas the Victorian office evolution centred primarily in the City with the work of many relatively unknown architect-surveyors, Edwardian office design attracted the best practitioners, and was concentrated in both Westminster and the provinces.

The work of many of these men has received considerable attention in recent years, particularly through the critiques written or edited by Alastair Service. These provide insightful analyses of the leaders and their accomplishments. The approach taken in the majority of the studies has been to elaborate on the lives of the architects and to put their works in perspective relative to the major architectural developments of the period. The analysis here will concentrate on the general trends in office building architecture. It will balance the leading works against those of the mass of followers, and approach stylistic trends in terms of the office building's unique needs and constraints.

The important issues in the twentieth century differed from those of the nineteenth. Street architecture moved in a new direction, with a degree of cooperation among architects previously unheard of. A multitude of styles was still evident, but they were often variants on fewer guiding principles. Compositional issues no longer responded primarily to awkward building massing, or functional need, but were now conditioned by street architecture attitudes and by individual
STREET ARCHITECTURE

There is perhaps no greater expression of the differences between Victorian and Edwardian architecture, and certainly no greater expression of the changes in street architecture, than the competition to design fronts for the new buildings along the Kingsway and Aldwych. The few Victorian calls for a unified street architecture had always been muffled by desires for picturesque variety and commercial advertisement. The greatest opportunities in the construction of new streets had either been neglected, as in the case of Queen Victoria Street, or had been lost through economic expediency despite the government's intentions, as in the case of Northumberland Avenue in the 1870's. In the closing years of the century a call for a unified street architecture was made by a number of architects, including Robert Kerr, J. J. Stevenson, and Alfred Waterhouse. The model was Paris, cited by one architect as 'the pride of France, the delight of the English and the heaven of the Americans.' The Paris Exhibition of 1900 must have given many an architect the opportunity to experience first hand that city's grand boulevards and rigidly controlled facades.

The London County Council shared these feelings. Remembering the criticisms of its predecessor's handling of the Northumberland Avenue scheme, and noting the 'apathy' evident on Shaftesbury Avenue and Charing Cross Road, the Council established a competition for the new streets. It was limited to eight chosen 'leading' architects. Recognising that 'London has materially suffered in the past from the fact that the architectural features of the main thoroughfares have not been adequately controlled by the authority
carrying out the improvements, it hoped to 'obtain the full value' of the newly created building sites along the streets through designs which would, 'in addition to utility, possess beauty and civic dignity, as some of the grand thoroughfares in certain continental countries.' The correlation between magnificence and monetary return was no small point, for the Council noted that the 'ultimate net cost of the improvements will be reduced in accordance with the increased dignity which the new thoroughfare may possess.' To assure this, the style suggested to the competitors was 'Palladian, freely treated.' Facing materials were limited to stone, marble, or granite; brick and terra cotta, the heart of 'bric-a-brac' architecture, were conspicuously restricted.

After considerable difficulty in getting commitments, the 'leading' men in the competition were: Ernest George, H. T. Hare, Reginald Blomfield, E. W. Mountford, Leonard Stokes, Ernest Runtz, William Flockhart, and Mervyn Macartney. The competition called for designs only for the fronts of 'business buildings' and one public building of an unspecified use, but which most felt should be the much needed LCC Hall. The fronts extended over 1-1/4 miles in length along the Strand and around the Aldwych crescent. None of the designs were to be built, a factor which discouraged several invited competitors. The winners, as assessed by Norman Shaw and W. E. Riley, the LCC architect, were to act as models for architects actually carrying out the work for private interests.

The response of the competitors to the call for 'Palladian, freely treated' was as varied as emerging Edwardian architecture in general. Mountford's design was reminiscent of his winning design for the Old Bailey; Blomfield borrowed heavily from Wren's Hampton Court additions; (9-1) whilst Hare made a contextual gesture to
Somerset House just across the Strand. (9-2) Macartney and George proposed applied orders as their main features; Stokes' version of the Palladian included elements drawn from the Royal Insurance Competition assessed by Shaw a few years earlier. Runtz and Flockhart were the most divergent: Runtz entered a design which the Building News labeled 'free and nondescript' and 'unsuitable for Chelsea flats,' and Flockhart produced a florid Louis XIV, making the most out of the style's pavilioned mansard roofs.

It took the assessors two years to issue their report, and when they did they praised the restraint shown by the competitors in their 'quiet and dignified productions,' but lamented that the rules had not simply called for designs of the English Renaissance. They awarded H. T. Hare the first premium, primarily for the skill exhibited in handling the corners and the design's adaptability as a model for others. William Flockhart was second, and would have won, except 'the influence of French architecture... (was) ... so perceptible in a design... intended for one of the finest sites in the British capital.'

The actual execution of the two streets failed to meet expectations in either quality or speed of completion. Shaw and Runtz started work immediately on The Gaiety Theater at one corner of the Aldwych, but other work went more slowly. The Morning Post, on a site set aside before the competition, was not started until late 1905. The LCC relaxed its stylistic convictions in an effort to secure ground rents, and, except for a limitation on materials, retained few controls. It was said to be less restrictive than any London estate. The reduction of restrictions was thought to be 'the greatest opportunity of recent years lost,' a disappointment,' absolutely lamentable,' and a sellout to 'sheer commercial greed.'
For the next decade the fronts were built with little of the coordination, breadth of scale, or unity of effect that had been hoped for. The notable exception to the random development came, however, at the lower end of the Kingsway where, just before the war, Trehearne and Norman designed complementary buildings of considerable frontage along both sides of the street. These buildings were also important as contemporary office expressions, and will be discussed later.

The competition designs were expressive of the period's quest for grandeur and civic monumentality, but they were also indicative of an ambivalent attitude toward office building needs. Whilst there seems to have been no question of the appropriateness of office buildings on so grand a street as the Kingsway or Aldwych, there was considerable reluctance on the part of the competitors to comply with the economic pressures and functional needs of office buildings. The Council had set the LBA height limit of eighty feet for the facades, but none of the competitors designed their fronts this high. In two cases the elevations comprised only three or four storeys. As the Building News quickly pointed out, such heights were simply not remunerative. The window openings on all of the designs were much smaller than the size thought to be necessary just a few years earlier in Queen Anne and Free Classic designs. The competitors found themselves caught between office building realities and public building aspirations. Few made serious gestures toward the needs of ground floor shop owners. Several employed circular and round headed openings in positions completely unrelated to ceiling levels, seriously limiting lighting. Efforts were aimed at external effect.

The attitudes of Shaw and Riley were clear. Those designs with the greatest accommodation of business needs, in the form of repetitive, large openings, such as Runtz's or Blomfield's, were not among
the winners. Additionally, the emerging Edwardian style, a modern interpretation of the Baroque, could not easily accommodate business needs.

Despite the failure of the Aldwych and the Kingsway as successful Grand Manner designs, the call for a unified street architecture continued and was heeded in towns all around the country. Regent Street, once defiled by the Victorians as being dishonest, boring and stuccoed, was repeatedly cited as a model of street architecture. T. G. Jackson called it 'the one fine and consistent piece of street architecture in London.' Beresford Pite concurred, adding, it was the 'only one of which as street architecture we can be proud.' With this example immediately at hand, and with Parisian streets still in their minds, the Edwardians sought to capture grandeur in consistent street designs whenever the opportunity arose.

Architects and clients cooperated in designs for adjacent sites to a degree that sharply contrasted with the competitiveness during Victoria's reign. The devices employed were varied. Stylistic compatibility with neighbouring buildings was tried. Beresford Pite attributed the neo-Greek embellishment of his London, Edinburgh and Glasgow Assurance Company to the proximity of Hardwick's railway station across Euston Square. John Belcher's uncharacteristically quiet offices for the Birmingham Daily Post on Fleet Street were designed in a 'severe and Classical' style in deference to Wren's nearby St. Brides. Paul Waterhouse continued in his father's role as architect for the Prudential. In a powerful stripped Greek design in Grimsby in 1912, in Aberdeen in 1909, and in a design study in 1917, he stepped his tall buildings down at the sides to match the height of the adjacent fronts. He did the same with the Atlas Office in Birmingham in 1912.
Continuity of facade elements was another approach. In Glasgow, John Burnet's Merchant House on George Square extended the base, cornice, and window architraves of James Sellar's 1878 Bank Buildings, which had extended the 1869 design of J. T. Rochead's Bank of Scotland in an unusual case of Victorian coordination. The trio formed a front on George Square equal in size to the City Chambers directly opposite. Sydney Mitchell and Wilson's Commercial Bank on North Bridge in Edinburgh was designed to conform to the general features of W. H. Beattie's Carlton Hotel down the street. In Edinburgh such sympathetic treatment might not be considered new, but in Manchester it was. Charles Heathcote, who had earlier placed contrasting buildings at the head of King Street, had changed his attitude by 1902. He designed the offices for the Economic Assurance Office and Parr's Bank on Spring Gardens in harmony, though with factors in the elevations to make each distinctive. Both buildings shared rusticated bases and cornices, and had similar domed turrets. The Parr's featured a range of applied columns, while the Economic had simple, square headed windows. In Westminster ten years later Lionel Barrett designed the front of his Barclay and Co.'s bank to share a base, cornice, and pilastered order with the adjoining Sun Fire Office, designed by another architect. F. W. and G. J. Skipper used a similar approach in their designs for the Commercial Chambers in Norwich in 1904. They had earlier designed the adjacent Norfolk and Norwich Savings Bank. The new building carried over its string courses, cornice, and robust Baroque detailing. The older building was in stone, and the new one in Doulton's terra cotta. The Skippers chose cream and brown colours, the cream to match the stone when immediately built, the brown to match the stone as it weathered.
A simpler and more common gesture was to align major elements such as bases, string courses, and cornices. In the City Ernest Flint's Orient House on New Broad Street of 1914 matched those of F. W. Mark's adjacent Egypt House some five years earlier. Metcalf and Greig extended Mewes and Davis's RAC Club's rusticated base, cornice and balustrade for their offices immediately adjacent. (9-10) In the Kingsway, M. E. Collins borrowed many of the same elements from the Land Registry Trustees Office for his Queen's House in 1917.31 Ironically, this was a rare effort of coordination on the Kingsway, and was unmatched by any architects except Trehearne and Norman.

Many of the leases on the Crown Estate were now falling in and the opportunity was taken by the Estate to enforce a coordinated street architecture. The unusual composition of Henry Tanner, Jr.'s shipping offices on Cockspur Street, (9-11) at the corner of Pall Mall, was due to the Estate's insistence that the cornice line continue those of the College of Physicians and Union Club on the same block. Unfortunately the Estate did not limit the office's height; it was considerably higher than either of these two buildings. As Tanner resolved the stylistic dilemma, the offices ended up with a cornice more like a belt than a cap. He further varied the composition, employing a regular giant Corinthian order at the ground and a picturesque outline at the roof, resulting in what The Builder's critic called a 'Gothic outline...clothed with badly-fitting Classic features.'32 More consistent, and more successful were the Crown's efforts on Waterloo Place. Thompson and Walford designed a stately Wren inspired building for the North British and Mercantile Insurance Company on the east pavement in 1911. (9-12) Their design, a virtual mirror image of Henry S. King and Co., bankers, on the opposite side,
was not built until 1915.\textsuperscript{33} An extension to the scheme, designed by E. Keynes Purchase and Durward Brown for Cox and Co., bankers, did not come until 1922.\textsuperscript{34} The finished result was a remarkably coordinated grouping of office buildings. (6-36)

The Crown's control in this effort, as well as that of shops on the contiguous Regent Street, was such that it made the LCC's decision to forego design restrictions on Kingsway and Aldwych in favour of quicker and higher priced leases, seem shortsighted. Even with all their Grand Manner trappings, the Crown Estate designs came across as stately but dull. More interesting and much more important street architecture developments were happening at the foot of Kingsway, where more significant building designs were being explored by other architects.

\textbf{EDWARDIAN BAROQUE}

Interest in the English Renaissance as an appropriate national style dates from the late 1880's in the work and public appeals of John Brydon.\textsuperscript{35} Norman Shaw at the same time was exploring the possibilities of a Wren based style for mansions in the country and in Westminster. John Belcher with Beresford Pite had taken a Genoese Baroque and combined it with Arts and Crafts decoration, particularly in the form of a dominant sculpted frieze, for their highly influential and much acclaimed design for the Institute of Chartered Accountants in the City. Norman Shaw in 1896 translated much of the inspiration of Scotland Yard to office purposes with his design for the White Star Steamship Line (5-143) in Liverpool, adding to it exaggerated Baroque rustication on the basement arched openings. J. F. Doyle combined many aspects of these designs in his Royal Insurance Building in Liverpool. (9-13) He included the Yard's gable treatment
with a scrolled pediment, the White Star's elongated and suspended corner turrets and a frieze reminiscent of the Accountants Hall. The design was notable for its vigor and breadth of overall treatment.

Doyle's design contained a considerable amount of late English Renaissance devices: blocked engaged columns, exaggerated keystones and open segmented pediments. The overall composition, however, was considerably free. Much more literal interpretations of the English Baroque, offering even more in the Grand Manner, were evident in public buildings and in competitions in the 1890's. Webb and Bell produced a modest English Baroque as a quiet neighbour to Inigo Jones's Banqueting Hall. John Belcher's Colchester Town Hall winner of 1897, and H. T. Hare's losing entry in the same competition, showed the Baroque with decided Englishness and considerable vigor. John Brydon's Government Buildings, William Young's War Office, and E. W. Mountford's Old Bailey, all designed between 1898 and 1900, were other influential English Baroque designs. The Kingsway and Aldwych competition, while it did not require the Baroque, certainly sanctioned the English. These designs set the parti for many, if not most, of the office buildings that were to be designed around the country up to the war.

During this period appreciation for earlier English designs was additionally enhanced by the publication of several books. Belcher and Macartney's 1901 Later Renaissance Architecture in England, Blomfield's History of Renaissance Architecture in England of 1897, and George H. Brich's London Churches of the 17th and 18th Centuries of 1896, offered their readers a considerable number of large format photographs for inspiration.
Free Baroque designs such as Doyle's Royal were never as popular in offices as the vigorous Edwardian Baroque, but the Free Style was for several years. Many designs made reference to the Royal. T. E. Collcutt produced a skillful design for the Lloyd's Registry of Shipping on Fenchurch Street in the City. (9-14) The front revealed influences of the Royal and the Accountants Hall, while the side showed a rare example of Arts and Crafts planning in office buildings: instead of literally following the curving street line, the external wall broke to express the sizes and shapes of the rooms within.

Bradshaw and Gass produced a rather flat, and somewhat French, version for the Royal London Friendly Society on Southampton Row in 1906. 37 Earlier, in 1899, Dunn and Findlay were much more literal, and better composed, in their Royal adaptation for the Scotsman Buildings on Edinburgh's North Bridge. (9-15) A small branch for the Bank of Liverpool, done in 1900 by Willinck and Thicknesse, was reminiscent of the White Star as well as the Royal. 38

A more popular treatment for office buildings directly followed the example of contemporary public buildings and Norman Shaw's Piccadilly Hotel and Alliance Assurance Office, (9-16) relying on heavily accentuated details, exaggerated rustication and keystones, Gibbsian surrounds, an occasional order, rooftop scrolls, open segmented pediments, and, if possible, a tower. The style remained popular for offices until the war, several years after it had fallen from favour in competitions and the more innovative public building designs. A construction photo of the Union Assurance Offices (9-17) by Ernest George and Yeates showed many of these features, and additionally indicated just how strong a presence the new style could have. The building, constructed in two stages, replaced Edward I'Anson's Royal Exchange Buildings. Although the newer building was not much
bigger than I'Anson's 'financial height' Victorian block, its scale made it seem considerably larger.

The style had been employed for office purposes as early as 1896, in an unsuccessful competition design for a bank in Halifax by F. H. Tulloch, and by John Burnet for the Savings Bank in Glasgow. Tulloch's design was more English, but Burnet's was more robust, with a massive rusticated wall keeping a tight container on the internal exuberance, which virtually leaked out at the window and door openings.

John Belcher produced a number of remarkable office buildings in the style. The first, designed in 1900, was Electra House on Finsbury Pavement in the City. Originally the design called for a window height frieze at the third floor and globes with cupids above the cornice, representing electric communications throughout the world. These were never constructed, but the heavily rusticated base and giant order were. For the completion of Winchester House on London Wall, Belcher employed the same robust detailing, but added Atlantes to support the cornice. On this building Belcher was working away from a strict academic Baroque, just as he had done earlier on the Royal London Friendly Society building on Finsbury Square. There he showed elements of Electra House in the rusticated, full height pedimented pavilions, but predated Winchester House in the straightness of its lines. He concentrated the stylistic energy in the corner turret and clock. Much of the success of these buildings lay in Belcher's subtle control over their exuberance by using careful proportions. As in the previously mentioned Birmingham Post, he displayed considerable skill in 'pyramidizing' his vertical openings. Window sizes progressively decreased through the careful alignment of piers, panels, and window edges.
One of the country's most uncompromising Baroque offices was done in Norwich by the Skipper brothers for the Norwich Union Life Insurance Co., designed in 1901 but finished in 1907. (9-22) The building was noted earlier for its progressive open plan. The Skippers exploited the lower land values in Norwich and set their main facade back from the street, surrounded by one storey wings. Rustication abounded. Considerable skill was shown in the handling of the articulated side pavilions: continuity was gained with the centre section by ending the quions part way up the angles, thus revealing a flat, broad wall surface. An equally skillful and exuberant building was the United Kingdom Provident Institution, designed by H. T. Hare in 1906. (9-23) Located on the Strand, the building exaggerated its curved corner site facing the Royal Courts of Justice. The front employed a giant order and abundant sculpting in a robust composition, exhibiting unusual depth for a London office block. An almost mannerist use of giant keystones, triangular pediments, and a string course cum architrave, with allegorical figures atop, brought the Edwardian pomp down to pavement level.

These buildings were unusual for their originality and skill, but they represented the vigour expected in Edwardian offices. Not all architects, however, were able to summon up commensurate skills or confidence in the Grand Manner. For the first several years of the
century, remnants of the earlier Free Classic remained. Transitional office buildings employed the motives of the Baroque, but tended toward the picturesque in character through their employment of small scaled features. A. N. Bromley in 1900 showed how difficult it was to employ Gibbs surrounds on an entire range of openings as closely spaced as was necessary for offices. Alfred Williams composed many of the mandatory Baroque elements in a picturesque asymmetrical manner for his design for offices on Parliament Street. Charles Heathcote showed hesitancy in taking on the style in his Parr's Bank of 1902. The amply sized dome was surrounded by timid blocked columns, which failed to make a sufficient connection to the corner piers and heavy rustication on the facades below. A design by Brown and Barrow in 1905 showed just how much Baroque intentions could be whittled away by the needs for adequate lighting in the City. Ernest Runtz's offices for the Anglo-American Oil Company, facing St. James's Park, had none of these constraints, but showed a similar lack of strength. Here it was diluted by late French influences. Two other transitional buildings in Westminster showed considerably more skill. W. D. Caroe's 1904 design for the Ecclesiastical Commissioners' building on Millbank Street carried on the best traditions of the Free Classic in its small scale features, varied materials, and picturesque window groupings. Its giant keystones, rusticated openings and blocked columns revealed its Edwardian date. The second design was done three years later on Pall Mall by E. Guy Dawber for the London and Lancashire Fire Office. The design tended toward contemporary French in its rusticated piers and iron railings, but the broken segmented pediment and a picturesque tower were undeniably Baroque.

These buildings hint at some of the considerable range of ex-
pression that was available to architects employing English Renaissance references. When controlled the style could be graceful, refined, and reposed, as in the design for Barclay's Bank on Fleet Street by Arthur Blomfield. (9-27) He used a similar adaptation of Wren on a sweeping front across from the Bank of England. (9-28) When done in brick, however, the effects were often gentlemanly and sublime. Lutyens produced one of the best examples of this genre in his offices for the Country Life on Tavistock Street in 1904. (9-29) Here, a rusticated base and carefully controlled string courses gave way to a brick front above, with generous architraves and a simple cornice. Another variation on the brick theme, but very picturesque, was C. Stanley Peach's block of shops and offices on Newgate Street in the City. (9-30)

These examples were unusual, however, for most office designs employed some variation of vigorous Hawksmoor and Vanbrugh derived elements. In the years leading up to the war, a common office building formula developed. It employed one or two storeys in a rusticated base, two storeys above (sometimes with a giant order), a cornice, another floor often set back several feet, a balustrade, and then several floors in the roof. The Lloyds Bank on St. James's Street by Wallen and Sons in 1914, another Lloyds in Manchester by Charles Heathcote and Sons, (6-30) (6-31) and Gordon and Gunton's Royal Office in the City were representative of the formula. When
an order was employed, it was quite commonly contained within terminal pavilions, as the two Lloyds examples showed. Even unusually high buildings, such as H. Percy Moncton's competition winning design for the Pearl Assurance Company on Holborn, (6-40) and the Calico Printers' Building in Manchester, (6-32) employed essentially the same compositions, although necessarily extended in parts.

Style in London was constrained by the London Building Act of 1894, which limited projections over the pavement to no more than two and a half feet. Architects desiring greater relief in their facades were forced to set their buildings back from the building line. In the City this was an expensive gesture, and several architects resorted to a flat form of Baroque, with very shallow decorative work. Gordon and Gunton's Chartered Bank (9-31) showed a typical response on the street front, with all the same elements, only flattened on the side. Several offices to let by H. Chatfield Clarke employed the flat Baroque on their fronts. At 17 St. Helen's Place he arranged elements in a fairly standard manner, (9-32) whilst his 55/56 Threadneedle Street of 1911,44 and earlier Shell House45 showed considerably more liberties in the composition. The finished results were like cartoon versions of the Baroque.

Despite its successes in the general composition of office fronts, the Baroque was notoriously unsuccessful in handling the shop front problem. The favourite ground floor opening was arched and rusticated, but when enlarged to accommodate shop needs, the results were weak and usually unsteady. J. S. Gibson's Caxton House was a good example. (7-9) Square headed openings could be even less successful, as shown by Charles Heathcote's Eagle Building in Manchester. (9-33) Ernest Runtz's Norwich Union Office on Piccadilly, with both types of heads was not much better. (6-41) The Baroque was a com-
bination of a great number of stylistic components, but it de-
pended for its success on the combination and relative proportions
of those elements. When some of these got out of hand, the designs
could be notoriously unsuccessful.

RATIONAL AND IRRATIONAL DESIGNS

Whilst the conventional Baroque accounted for a greater number
of office buildings, explorations by architects in a variety of di-
rections attracted considerably more contemporary architectural in-
terest. Some architects sought to bring Arts and Crafts ideals to
street fronts in designs relatively free of conventions. A few
explored an appropriate expression for modern framing materials, and
others extended Baroque gestures into stylistically irrational
Mannerist ones.

In Glasgow at the turn of the century there was considerable
interest in Free Design and vertical expression in office buildings.
Mackintosh's design for Honeyman and Keppie's Herald Building of
1893 (9-34) and James Salmon's St. Vincent Chambers of 1899 (9-35)
were early examples. As Glasgow entered the twentieth century, how-
ever, a more restrained, Beaux Arts influenced design began to pre-
dominate, and the leadership in Free Design passed to London.

Alastair Service has traced Treadwell and Martin designs in
various small offices in Westminster. 46 Whitehall House was their
tallest, most severe, and most vertical effort. (9-36) It displayed
an almost complete lack of concern for any of the more popular styles
of the day. Service also identified the uncompromisingly novel,
single bay design facing Soho Square by R. J. Worley. (9-37) It
was highly reminiscent of Halsey Ricardo's earlier front on Great
George Street. (5-104) Another London firm exploring Free Design
was Metcalf and Greig. Their design for Oxford Street gained verticality through four storey shafts. (9-38) It resolved the ground floor shop problem with an arch. Above it, the only row of plate glass in the building made a virtual loggia. Their design a year earlier with some of the same features was even more successful. Called Kingsway Chambers, (9-39) it was located next door to Lutyens's offices for The Garden. The name was ironic, for the building was the most uncharacteristic one on Kingsway. Metcalf and Greig employed six discontinuous shafts across the front; two of these supported a central oriel window. Mackintosh-like eyebrow hoods capped arched openings at the top and supported a pronounced gable.

Rational expressions in office design have been identified by Service as related to emerging structural techniques, but the relationship was erratic at best. Expression of the full frame and the continued need for large windows has been discussed. It is more appropriate to associate the few highly rational designs for offices with the uniformity of office functions or with the stylistic idiosyncrasies of their designers. William Lethaby's Eagle Insurance Building in Birmingham of 1899 set the spirit for several that followed by other designers. (9-40) In a building with a commonplace plan, Lethaby produced an uncommon front, characterised by a relentless grid of windows and floors of equal height, accentuated by simple cornices at each floor and works quality railings. Coming at the end of an era of emphasis on the vertical, and just preceding the age of the horizontal emphasis, the Lethaby design had neither. John Burnet's Kodak House on the Kingsway from 1910 was the building that perhaps most directly incorporated the styleless regularity of the Eagle. (7-15) Its sparseness was quite uncharacteristic of Burnet at the time, but was appropriate for an American company and for a
building which was as much warehouse as it was offices. Burnet was one of the first in Britain to employ the American device of metal spandrels. The steel frame might be suggested by the straight and long column-like verticals, but Burnet's hesitancy to fully express the frame was belied by the vestigial keystones in the subtly curved cornice.

A design which shared many of the elements of the Kodak, yet with an entirely different character was F. W. Troup's Blackfriars House of 1913. It employed the same elongated columns, regularised windows, and non-structural keystoned flat arches. Troup, an Arts and Crafts regular, made the building Classical in gesture, with a base, four storeys as an order, one storey as an entablature, and an attic with a balustrade. However, the proportions and the material, white Carrara, were definitely unclassical.

Other designs worthy of note for their regularity and simplicity include Aston Webb's Grand Trunk Railway Office on Cockspur Street, and Leonard Stokes's offices on Golden Square, both in Westminster. They verged toward Modern French in some of their details, but were so individually stylised that there could be no mistaking their rationalist intentions. Another building, remarkable for the restraint and timelessness of its detailing, but relatively unknown, was the Church of Scotland building on George Street in Edinburgh, designed by Sydney, Mitchell and Wilson in 1911. Showing the influence of Burnet in its eaves gallery, it was otherwise a continuous rusticated wall over a flat arcuated granite ground floor.

Intellectually close to these buildings but visually different were some of the designs of Belcher, Holden, and Pite, which extended the Baroque to almost Mannerist proportions. The structural steel frame was given more expression by Belcher and Holden than perhaps in
the works of any of the rationalists. As has been noted, Belcher argued in his *Essentials in Architecture* that a building must appear strong but still be a true expression of its structure. In his designs for the Royal Insurance Office of 1908 (7-12) and Mappin House, completed in 1910, (7-13) Belcher used marble facings. The material was unusual in London, but had been sanctioned since Ruskin's days as a structural facing. The Mappin House was a composition of thin members. Recessed floor lines allowed its two street fronts to read as rows of columns holding pilasters holding coupled columns supporting arches. The design showed some visual weakness at the column-pilaster joint. This problem was not evident on the Royal offices, where Belcher relied more on applied ornamentation and bay windows resting on an oversized second floor entablature. The entablature was so large that its bottom line fell well below the first floor ceiling line. What was lost in the lighting was more than made up for in compositional effect. Most prominent in the design were the exaggerated keystones and blocks, some even larger than the niches, characteristically without content, that they surmounted.

In their general character these buildings were similar to the office designs of Charles Holden. Belcher had been using elements with crispness and without entasis since the beginning of the century. Holden's work consistently incorporated the same devices. His Norwich House on High Holborn of 1902 was an essay on the simultaneous interpretation and misuse of elements. Spandrels looked like keystones; keystones slipped through architraves; powerful piers terminated in empty niches. The Evelyn House design of 1908 (9-42) was done with Classical motifs, but they were so abstracted it is difficult to apply traditional terminology to them. His office building for the British Medical Association (9-43) of 1906 borrowed
heavily on Belcher's initial designs for the Electra House. Without the rustication but with fragmented motifs, it read more as an abstract composition of planar elements.

The last Mannerist of note is Beresford Pite. While in Belcher's office, Pite designed the competition entry for the 1896 Royal Insurance Building, which, as Service points out, had a Michelangesque quality.51 Pite's insurance office on Euston Square of 1907 has been mentioned for its self-conscious references to Hardwick's railway station. (9-4) The detailing, however, made light of Hardwick's dignified Classical gestures. The insurance office abounded with mannerist effects: openings with single, centrally placed columns, column bases that were extended to become rain gutters, consoles that dropped to become keystones. Pite's other notable venture into office design in 1902 was unfortunately only a project, for had it been built, it would surely have become one of the most prominent and provocative buildings in London. (9-44) The site was on the Thames Embankment, and on it Pite piled up giant cubical masses culminating in a central office tower with a temple front on each face. The motifs were verging on the Baroque, but in massing the office was positively startling.

Whilst these works explored the possibilities of irrational design, others explored the rational expression of a new material: concrete. Office buildings in concrete have already been noted. Of those buildings the most innovative and rational was Lyon Chambers, by Salmon and Son and Gillespie in 1907. (6-28) The major influences were vernacular and Arts and Crafts inspired. Walls, only four inches thick, were rendered with cement mortar, a gesture that at once was Scottish vernacular and a rational expression of the frame. The elevation treatment exploited concrete to the fullest,
with unusually large openings, even for Glasgow. Walls canted out progressively outward, rising vertically. Much of the effect was for compositional purposes: applied brackets softened a cantelever, a reinforced concrete arched opening unified other openings, and the flat roofline was disguised by applied gables. A far more rational roof treatment was in Woods and Sellar's small office in Oldham, where a flat parapet sheltered a flat roof. 52

The stylistic response to concrete as a framing material in offices was no more convincing than that to steel. Investigations into both materials were fettered by long standing stylistic attitudes and the typical conservatism of clients. The British Architect, searching for an appropriate concrete expression, held a competition in 1909. The subject was an office over a shop. The inclusion of the shop was significant for no really satisfactory design solution had been found, even at that late date. Designs by Gillespie and Voysey were among those premiated. Gillespie had the better composed of the two, (9-45) but he reduced the shop span to reasonable proportions with two columns. Both architects applied coverings to their concrete walls: Voysey, a mixed collection of teak, marble, and stucco; Gillespie, a mixture of ground marble and cement. Concrete finish was still considered ugly; Ruskinian principles of veneers as 'truthful' coverings were still followed.

FOREIGN INFLUENCES AND CLASSICAL IDEALS

The major competitor of the English Renaissance in office architecture was not from the rational or irrational styles just identified. Despite contemporary hopes for a decidedly British architecture, office building designs of the period showed the considerable influence of contemporary French and American design. The French
inspiration was not new, at least in office architecture. It had never really disappeared since its emergence in the 1850's. The American influence, however, was new. As has been noted, the British disliked American developments in Chicago. It was not until the Americans began producing Beaux Arts Designs on a scale far surpassing those in France that their architecture began to be appreciated in Britain. Then, as the war approached, a purer Classical style, devoid by intention of nationalistic trappings, began to take hold.

French design in nineteenth century British architecture in general, and offices in particular, was focused primarily in the roofscape and in exuberant decorative motifs. These features, particularly the roofs, continued to enjoy popularity in offices until the war. High crested roofs had been a feature of Flockhart's second place entry in the Kingsway-Aldwych competition, and were very much the focus of designs in Westminster as late as 1914 by Gordon and Gunton and in 1914 by Arthur Blomfield. (9-46)

After the Paris exhibition of 1900, the primary focus of Modern French design moved from the roof to the wall surface. This became Neo-Grec: flat and planar, with decoration reserved as an emphasis rather than an overall wall treatment. The British reflection of Modern French design didn't come until the middle of Edward's reign, when Mewes and Davis's Ritz Hotel on a prominent site on Piccadilly displayed one of the best examples of the style. The same architects followed almost immediately with their Morning Post Building on Aldwych. (7-10) The two contained many well-proportioned features in elegant displays of Reginald Blomfield's 'Grand Manner.' The main elements were thinly chiseled rustication, simply architraved openings, flat recessive piers, garlands and festoons draped at
points of accent, modest iron rails, and capping, but not aggressive, mansard roofs. The essential qualities of this Neo-Cretan treatment were simplicity and refinement, not the rigid orders or compositional totalities that were characteristic of the English Baroque.

Both of the Mewes and Davis buildings employed arcuated ground floor openings, but this element was omitted in many of the designs that followed. Frank Verity showed on Regent Street (9-47) how to set the style over a shop front and integrate vertical openings. Later followers took liberties as well as inspiration from the style. As in the nineteenth century, the popularity of French design in offices resided in its flexibility.

M. E. Collins's Land Registry Trustees Office on Kingsway, previously noted, was a highly repetitive affair, but the design was made coherent by its planar pilasters and integrated opening treatment. (9-48) His design for a large block on High Holborn (9-49) in 1914 approached a giant scale with an architrave at the second floor, broad rusticated piers, and vertically composed openings. Frank Elgood's Dewar's House on St. James's St. was straightforward commercial at the bottom and Scottish Baronial at the top, but the middle was held together by repeated French Grand Manner piers. A much better design, one incorporating Baroque sculpting and pediments with a Francois Ier roof and lantern, was John Burnet's 1909 design for the General Assurance on the Aldwych. (9-50) A material change from Portland stone to granite emphasised this rare twentieth century example of 'pyramidization.' These diverse elements, including Burnet's characteristic eaves gallery, were held together by a very simple French wall and architrave treatment.

As in their nineteenth century predecessors, few French inspired
office designs had the intellectual content or the architectural finesse to make them worthy of serious attention. The Morning Post building was never surpassed by any of its followers, except perhaps by Burnet's General Building. That design, however, strayed farthest from the French sources.

Concurrent with the echoing of the French Grand Manner was the new appreciation of American Beaux Arts design. Charles McKim had received the RIBA Gold Medal in 1903. Both Leonard Eaton and David Walker have cited the American influence in John Burnet's work. Eaton has also noted the influence of Donald Burnham's Selfredge's design of 1908. This brought the powerful American Beaux Arts to the heart of London. Service has credited the design to Francis W. Swales, an American in London. It was Swales who wrote a long praise-filled article on American commercial buildings in the Architectural Review in 1908. As has been noted earlier, the Builders' Journal followed a year later with an American survey extending to over eighty pages.

The American influence on Burnet can be seen as early as the turn of the century. In his Waterloo Chambers (6-27) and Atlantic Chambers, (6-26) both from 1899, Burnet employed eaves galleries and a vertical emphasis with the American favourite treatment for tall buildings: base, shaft, and capital. The stylistic treatment otherwise was considerably free. In Glasgow at the time vertical treatments were common, but Burnet's interpretation of the American formula was solely his. Burnet carried the motifs to London with him, but they never really caught on until several years later.

His sources were as much Chicago as they were American Beaux Arts. Another who used similar sources was the unpredictable Liverpool architect, W. Aubury Thomas. He had no single stylistic niche,
moving from inspiration to inspiration with each building. His State Insurance Building of 1906 was Gothic, verging on Art Nouveau. His larger buildings were decidedly American. The Tower Buildings, completed in 1910, showed a Chicago influence with horizontal window openings stretched between the white Carrerra coverings of the steel frame. (6-34) Only miniature domes on the roof and dissonant scrolls spoiled the otherwise matter-of-fact expression. Thomas's Royal Liver Friendly Society was immediately in front of the Tower Buildings. (6-33) He embellished its concrete frame at the top with an exuberant Free Baroque collection of turrets, clocks, and domes. At the bottom he established a rusticated base. Thomas followed American fashion by treating the granite faced walls in between as a shaft, simply holding the two focal areas apart.

Opportunities for American compositional treatments were not very common. What attracted the British to American design for office buildings was the grandness of scale and the power of giant features that Selfridge's had shown so well. These qualities were missing in the modern French, and available only with busy cluttered decorative effects in the English Baroque.

A small country bank by Edward Maufe, completed in 1915, clearly showed the power of the style. (9-51) Banks in small towns were generally smaller scaled and more picturesque than their city counterparts. This front in St. Albans imposed an almost temple-like presence on the street with its generously treated Ionic columns and sarcophagus motifs between. Both of these were American bank favourites. A similar handling of features on a large scale was done by William and Howard Hunt on a small front in Westminster off Regent Street. (9-52) Here, in a space barely large enough to hold them, was a column, shaft and capital composition with Greek inspired
details. W. A. Thomas did another version of the American Beaux Arts for his Daily Post Building completed in 1913. Here arcuated openings contained the ground and mezzanine floors. The latter was marked by a metal spandrel, another American feature. A powerful base supported an unusually flat shaft. Shallow pediments and heavy corner blocks emphasised the building's cubic qualities and gave it a characteristically American massiveness.

With the wide publication of numerous American designs, it was perhaps inevitable that some office designs would almost literally show their American sources. West Africa House in Liverpool, (9-53) designed by Briggs, Wolstenholme, and Thornley in 1914, was a close reflection in character, if not in detail, of Carrere and Hastings's Black, Starr, and Frost Building in New York. (9-54) A. D. Hislip lifted his Phoenix Assurance Building in Glasgow to the top of a two storey range of three-quarter columns and corner piers in 1913, (9-55) just as McKim, Mead and White had done on their Knickerbocker Trust Building. (9-56) Even more literal was Delissa Joseph's piling of one order on top of another with a cornice in between on the Universal House on Oxford Street. (9-57) McKim, Mead and White had done the same thing on their National City Bank in New York. (9-58) The upper order was an addition to the bank; Universal House, however, was built all at once.

There were probably fewer office buildings designed with American derivations than with French. Many were Classical without showing strict allegiances. Even in the years just before the war, most office buildings still displayed some form of the English Renaissance. In those last few years there emerged another Classical variant, most aptly called the 'Stripped Classic.' Its significance lay in its formation of the basis for post-war British architecture, particularly
in offices, and for the manner in which it so adeptly responded to the unique compositional problems of offices.

The most vocal proponent of Classical design in architecture was A. E. Richardson. In 1911 at the RIBA he called for 'a return to that disinterested search for perfection' that characterised the Classical spirit. 'When a work of art approaches the classic ideal it ceases to be novel or remarkable; what is more important, it becomes grand and permanent, it attains to the sublime and the monumental.' In 1914 he produced his sumptuous work, *Monumental Classic Architecture in Great Britain and Ireland*. At the AA in 1915 he argued that the Classic was the 'Architectural Spirit of the Age; assuming an international character...tending towards academic principles and the banishment of provincialities from design.' For the British, who were 'outclassed by the French...and jealous of... American cousins (and in a) babylonian confusion,...a way out of the architectural maze (was) shown by the old classic truths.'

As was noted, the Classical influence in office buildings never really disappeared in Victoria's reign. J. MacVicar Anderson, mentioned for several designs at the turn of the century, continued in the same manner right up to his death during the war. His Phoenix House, built in 1914, incorporated the primary features of the stuccoed, late Georgian buildings previously on the King William Street site.

The kind of Classical design, however, that Richardson advocated was Stripped Classic. Features were broadly treated, massing was simple and block-like, and projections were well within the LBA two and a half foot limit. The first public building in the style was Edwin Cooper's St. Marylebone Town Hall in 1911. Richardson, with his partner Lovett Gill, showed the first adaptation of the style to
business buildings in his winning entry in The Builder's Regent Street competition in 1912. The design for the Quadrant, (9-60) surrounding and facing Shaw's vigorous Piccadilly Hotel, was capped by a Neo-Greek cornice which aligned with the one on the hotel. But here the similarity ended. The proposed fronts were flat and spare, with most of the architectural detail concentrated in a balustrade at the second floor and the architraves just above. Shaw's problems with the shop fronts on the hotel were notorious; conversely, it was on the shop fronts that Richardson and Gill excelled. A balustrade capped a continuous range of coupled consoles. In unison they acted like a lattice girder to span the shop fronts below and act as a base for the massive wall above.

The partnership's first office building was the Southampton House, designed in 1914 (9-61) for a narrow street off High Holborn. It relied almost entirely on proportions for its effect, for the brick and stone front on a steel frame had virtually no decoration. The real opportunity to design an office block and exhibit their shop front solutions came a year later with Moorgate Hall in the City. (9-62) Here a variant on the Regent Street lattice girder was tried, with a surprisingly flat wall above, again relying on proportions for success. The architects had such confidence in their girder that they minimised the size of the ground floor supports and even allowed them to be irregularly placed.67

The Stripped Classic was explored by a few other architects before the war was over. Ernest Newton designed a simple front for the Martins Bank on Lombard Street, (9-63) with three floors within an order, on a base of arched openings. It was in brick, a material still considered appropriate only for a private bank in the City. Unfortunately it was never built. The Hong Kong and Shanghai Bank,
designed by W. C. Campbell Jones, employed the same compositional features, but was considerably more decorated. By far the greatest exhibition of the new style came on the Kingsway, in the designs for a number of buildings by Trehearne and Norman. These buildings have been cited for their contemporary planning, but their architectural design was equally noteworthy. Planning requirements had an effect on the designs. Business pressures called for large window openings; Trehearne and Norman responded with wide openings, sills often on the floor, and heads flush to the ceilings.

By 1914, nine years after the dedication and fourteen after the ill-fated competition, Kingsway building sites were finally disappearing. Trehearne and Norman received the commissions to design some of the most prominently sited buildings on the street. The first were Empire and India Houses, (7-14) in late 1914 on the northeast corner of the Aldwych intersection. These were quickly followed by Canada House, (9-64) immediately adjacent on the east side of the Kingsway. In late 1915 the firm was commissioned to design Shell Corner, (9-65) on the northwest corner of the Aldwych intersection, with frontages approximately reflecting Empire and India Houses. On the east, Victory House (9-66) was started near Lincoln's Inn Fields, but its date is uncertain.

The total frontage of the Trehearne and Norman designs was over 650 feet. This alone would have made them an important addition to the Kingsway, but their location, framing the beginning of Aldwych, made for a significant design opportunity. If the hopes of the 1900 design competition were being eroded by expediency, at least at this critical junction they were fulfilled.

The significance of the Trehearne and Norman design lay in their taking the Stripped Classical style, as promoted by Richardson,
and applying it with considerable skill to buildings whose vertical dimensions far exceeded reasonable Classic proportions. Due to business requirements the height of the fronts, eighty feet to the parapet, was a foregone conclusion. Trehearne and Norman responded to the 100 foot width of Kingsway with a giant scale that was convincing, despite the shallow depth of the fronts. Success was due to proportional finesse and well placed decorations.

All of the buildings employed the same compositional approach with minor variations. Large scale rhythm and stability were secured by vertical pier treatments at the angles of each building, and by two storey architraves adjacent to the orders. Contrary to the typical contemporary approach, the architects sought to increase the stability of the ground floor by pulling the glass line out to the face of the stone fronts, thereby emphasising planar qualities rather than treating the glass as a void.69

Within this overall compositional format, features were varied to produce a small scale interest. Empire and India Houses had the black marble band. A pilaster on one building would become a three quarter column on another. The extent of the ranges was varied. Canada House was compositionally the most interesting, for it was the only one to employ a 'pyramidized' shop front.

Goodhart-Rendel recalled that Thomas Tait, John Burnet's partner and successor to the firm, 'ghosted for Trehearne and Norman in Kingsway.'70 The thought is tantalising but it is difficult to substantiate beyond Goodhart-Rendel's memory. The surviving office of Trehearne and Norman has no extant records; nor does the RIBA biographical file. Tait, by the time of the design of these buildings, had been with Burnet at least nine years. But the resemblance between these buildings and Burnet's earlier work, particularly the
CSPS Store (9-67) and R. W. Forsyth's, (9-68) was too close to be mere coincidence. The design elements common to both firms included giant scale features, two storey shop fronts with metal clad first floors, well spaced piers, vertical emphasis at the angles, the third floor acting visually as a girder, an order of two or three storeys, and an entablature cum floor or eaves gallery. The intended teak eaves on the Canada House would have further cemented the relationship. The black bands on the Empire and India Houses were like those Burnet used on the General Assurance building. If Tait did not design the Kingsway buildings, then Trehearne and Norman were remarkably good students of Burnet's designs.

CONCLUSION

The Stripped Classic displayed on these buildings was an appropriate one for the Kingsway and for office buildings in general. The style was so large in scale that it comfortably contained the necessary oversized windows, and presented to the public extensive frontages that effectively established the corner without showy effects or exuberant displays. (9-69) The Trehearne and Norman designs framed the entry to Edwardian Britain's most important boulevard, and in doing so maintained at least the gesture of the hopes for unity and dignity that fueled the 1900 competition.

From the time of the competition through the First World War, the prominent site at the foot of the Kingsway in the Aldwych crescent had remained empty. The competitors in 1900 had hoped it would be the site for the LCC Hall. Over the years it was proposed for a variety of projects, including an American skyscraper, a French products exhibition, and a centre for Commonwealth governments, but none of these ever reached the design stage. It was not until 1920
that an American company, the Bush Company, leased the site to build a centre for the sale of manufactured goods. The building fittingly closes this stylistic analysis. The architects were an American firm, Helmle and Corbett. The design was Stripped Classic, Roman in scale and gestures, but Greek in detail. Designed as a termination of Kingsway, its central building featured an apsed entry rising the full eighty feet of its front. (9-70)

The building can be read as one simultaneous gesture incorporating the American influence, the Stripped Classic, and most importantly, the arrival of the office building to a position of monumental public prestige. Office building designers had been aspiring to this for three quarters of a century. The Builder, no doubt expressing this appreciation of office buildings chose Bush House, framed by the various designs of Trehearne and Norman, as its calendar picture for 1922. The office building had finally achieved public acclaim.
CHAPTER 10
CONCLUSION

From the small, house-like 'domestic buildings' of the narrow City streets to the gigantic blocks of the Kingsway, the formative evolution of the office building comprised dramatic changes in form, structure, services and style. These changes brought the office building to the beginning of our modern period.

It is quite probable that no other building type changed as dramatically as offices did in these years. Yet most of the change was with little or no fanfare. It was generally incremental, with the different aspects of offices changing at different rates and different times. The major exception to this pattern was the overwhelming changes in all aspects around the turn of the century. Planning attitudes changed, full framing replaced the bearing wall, central heat replaced the open fire, and electric lighting was introduced. The office building moved closer to the centre of the stylistic milieu.

THE VICTORIAN YEARS

The nineteenth century can be characterised as a period of consistent values and slow, but persistent change. Banks built the most memorable internal spaces, products of stylistic aspirations and Gilbart's functional prescription. But it was in offices to let that the most intense and characteristic factors of Victorian office design
were most evident. Built on speculation for use by any of the numerous small businesses, the office to let simultaneously responded to relatively unchanging, but demanding, business needs, and the constantly increasing pressures of the growing Victorian city.

Business needs demanded rooms for offices, well lit and easily accessed. These rooms were never large and were rarely decorated as proper Victorian architecture invariably was. The open fire and the gas burner served these spaces well enough. The lift, introduced with great caution, was easily assimilated into building planning, and caused only a subtle impact on building height. Patent 'fire-proof' floors were integrated with little impact on planning or style. Internal columns were introduced, not for business needs, but for rental flexibility. They allowed internal walls to be built to the needs of each tenant. Lighting demands so overwhelmed the stylistic goals of stability and repose that very few Victorian offices could aspire to be great architecture in contemporary terms. Regularity of geometry gave way to the exigencies of site shape. Maximisation of rental area, without sacrificing natural lighting, was the single most important consideration in Victorian offices.

Business demands and increasing land values required larger and larger office buildings, particularly in the City. Growth pressures were countered by the 'Laws of Ancient Lights,' which at times made it difficult to build even a four storey walk-up building, much less a higher one served by a lift.

There may be no other building type that more emphatically expressed the difficulties imposed by 'Ancient Lights' than office buildings. In constant evolution through court interpretations, 'Ancient Lights' were so restrictive in the City that office design became a matter for specialists. Wise to the practicalities of
office function, appraised of the latest quirks in the law, and willing to negotiate with a multitude of surrounding property owners and tenants, these architects were the mainstay of City office design. Edward I'Anson, the Francis brothers, the Chatfield Clarkes, and John Whichcord were the most visible of the men in this unheroic, generally overlooked contingent of the profession.

Perhaps more importantly the difficulties of office design repelled the leading Victorian architects. In London, where architects could specialise in building types, the leading men only made occasional forays into office design. Cockerell's London and Westminster Bank and Shaw's New Zealand Chambers were the two most noteworthy ventures. Both of these buildings had enormous impact on office design, as well as architecture in general. Cockerell set the standard for bank hall form, while Shaw inaugurated the first style to embrace the office building's need for abundant natural light.

In the provinces office design was a part of any architect's well-rounded practice. Locals such as Bruce Gingell in Bristol, and David Rhind and David Bryce in Edinburgh, produced buildings which made lasting contributions to their respective townscapes. Office buildings in Liverpool and Manchester were built to respond to unique local demands. In Liverpool some had glass enclosed courts, whilst many were 'buildings': contiguous but separate blocks, often around open courtyards. Both Manchester and Liverpool had buildings designed for the cotton trade, with warehouse and office spaces sharing the same floors.

Technology had a hesitant integration in Victorian offices. 'Fireproof' framing, surrounded by confusion in its formative years, finally found general acceptance. Central heating, however, did not. Electric lighting, the upstart alternative to the dirty gas burner,
gained steadily in application, but the nineteenth century office was predominantly gas lit.

THE EARLY TWENTIETH CENTURY

The twentieth century was decidedly different. Open office planning emerged with the new theories of scientific office management. Office staffs changed as women entered the work force in numbers. The sedentary, masculine Victorian office was superceded by an active, noisy, machine filled office where efficiency and control were the motivating factors.

Building improvements were multiple. The electric light replaced the burner; central heating replaced the fire. Full framing gained acceptance as an alternative to bearing walls. Streets of offices, particularly the Kingsway and Aldwych, gained the professionals' attention and captured the public imagination. Office needs for natural lighting, never diminished from Victorian days, gained stylistic acceptance and integration in the new Classic styles. Even the ubiquitous shop front, for decades the major flaw in the stylistic success of any office building, became accepted and integrated in buildings on the Kingsway.

Leading architects took on more office commissions. John Belcher, who long before had left his father's City practice, returned after the turn of the century. With reputation firmly established, he produced a series of memorable office buildings. More important to office design was the arrival of John Burnet in London. In Glasgow he was one of several locals designing innovative buildings. In London he emerged as a leading practitioner, venturing regularly into office design. He tamed the shop front at the Royal and at Mappin and Webb, while simultaneously offering an honest expression of steel framing.
For the General Assurance he, like Belcher before him, brought style to office planning. In the Adelaide House, one of the last buildings in this evolution, he not only maintained style in planning, but also stretched office spaces to greater depth than had been achieved before.

A ROLL CALL

Burnet's work, in many ways, represents the culmination and conclusion of the early office building evolution, although other buildings are worthy of note.

The different aspects of offices evolved relatively separately from each other. This study reflects those separate evolutions. While allowing detailed attention to each, the approach potentially undervalues important individual buildings. With rare exception the office building evolution was not shaped by individual buildings, but by the needs, pressures and technologies shared by all offices. Individual buildings, however, act as markers of change, often giving it vivid expression. It is appropriate to conclude with recognition of a select grouping of office buildings that represent important stages in the early office evolution.

Among the first and most influential buildings was C. R. Cockerell's London and Westminster Bank. Cockerell translated the dignity of the Bank of England to commercial purposes. With his collaborator, Tite, he freely borrowed Soane's domes and set the standard for seventy-five years of banking halls. Another important early work was the Brunswick Building, built in 1843 in Liverpool to the designs of A. and G. Williams. The Brunswick adapted Barry's Pallazzo style for office use, and with its glass roofed courtyard, helped establish a form for offices that enjoyed minor
popularity in Liverpool.

The rush of office construction in the 1850's and 1860's, following the Joint Stock Acts, produced several notable offices to let. While incorporating new principles and reflecting new pressures of office design, they represent the emergence of the office as a distinct new form. John Whichcord's 9 Mincing Lane, (2-51), Water Lane buildings (3-7) and Mansion House Chambers (2-56) expressed planning alternatives and facade limitations. Whichcord allowed flexibility in partition layout while still utilising internal bearing walls. Palmerston Buildings, surviving in spirit through the records of the City Offices Company, must be noted for its unusually large size as well as its characteristically crude facades. (2-60) Edward I'Anson's Colonial Chambers made early use of internal iron columns, (2-26) and featured exaggerated openings for lighting, even beyond the limits of the MBA. (2-25)

The Palmerston Buildings remains as perhaps the best record of the cost and caution associated with early lift installations. Delissa Joseph's St. George's House of 1883 (2-85) was one of the first buildings to integrate the lift; the ubiquitous location was in the well hole of the stairs. St. George's House also displayed two new, soon to be common features: a few more storeys than its walk-up predecessors, and at the rear, a stepped profile in response to 'Ancient Lights' problems.

The model for banking halls was greatly extended by John Gibson's National Provincial Bank, Bishopsgate, designed in the early 1860's. (2-14) In addition to a grand office for the largest concentration of clerks in the country, and a facade to set the standard if not the style of future bank design, Gibson produced a building which was heated and vented by an elaborate, state of the art central system.
His finesse in negotiating and working within 'Ancient Lights' restrictions was particularly evident in building section. (2-15) The building remarkably showed no scars from the process.

While Gibson's Classical style may have had few literal followers, the visual stability he produced on the National Provincial facade was the hallmark of good Victorian design. (2-36) Ten years later Norman Shaw built his affront to City sensibilities: New Zealand Chambers. (5-92) With a virtual glass wall and quaint detailing, it set off twenty-five years of stylistic cacophony in office design. It is unfortunate that few of its progeny displayed the same skill in execution.

The saving grace of Shaw's work is most evident by comparing it to some Liverpool buildings: York Buildings by J. A. Picton, (5-23) and Manchester Buildings (2-72). These show the mediocre levels of design and difficulties in gaining sufficient light typical of so many designs through the middle Victorian years. On the other hand, they represent two planning features unique to Liverpool. York Buildings was a series of small buildings arranged around a court; Manchester Buildings was a combination office and warehouse, with an all-glass rear wall, even more open than New Zealand Chambers.

A characteristic London planning pattern came to a symbolic end with Cuthbert and Wimble's Royal Courts of Justice Chambers, built on the Strand in 1883. These City office specialists brought flexible partitioning to a building designed mainly to house solicitors' offices. After this there were apparently no more solicitors' buildings built on the traditional university model of rooms arranged around stairwells. The building was up to date in one more aspect: it had one of the first office installations of electric lighting.

Fire hazard was a constant concern in Victorian office design.
Confusion and doubt were as common as experimentation and proprietary systems. Much of the confusion was allayed by John Whichcord's highly publicised testing of the fireproof floors in his National Safe Deposit Building in 1873. (3-12) Unfortunately the commonplace Italian facade, still standing today, does little to make memorable the events surrounding its construction.

Another ordinary facade hid the embryonic steel frame in Edward Ellis's 3/5 Rood Lane. (7-5) This building summed up several of the common characteristics of late Victorian offices in the City: 'Ancient Lights' problems, exploitation of the basement for office use, and large areas devoted to windows.

Whilst the frame of Ellis's building was never recognised, the greatest notoriety surrounded the construction of another steel framed office several years later, the Morning Post. (7-9) (7-10) By the time the Post was built in 1905, Edwardian office buildings were already showing marked contrast to their Victorian predecessors. The Post, framed 'on the American principle,' was even built by an American builder. Its chaste Neo-Grec facades were French, a style which, in various forms, never lost popularity in offices. The building, on a rare free standing site, was a part of the promise for a coordinated street architecture on the Kingsway and Aldwych. The hope was that these new streets of offices would set an example for the nation, and prove that coordinated design could emerge from the chaos of the multi-tongued Free Classic of the late Victorian years.

The Post was French, but the favoured new style was the nationalistic English Renaissance. Promoted by the Kingsway-Aldwych design competition of 1900, (9-1) (9-2) (9-3) the style had the flexibility to be robust and overpowering, or sweet and domestic. Additionally it lent itself exceptionally well, through its string courses, balus-
trades, and cornices, to neighbourly street compositions.

Architects in Glasgow weren't so much concerned with neighbourliness as they were with an American interest: vertical expression. Whilst there were several examples, John Campbell's Edinburgh Life Assurance was representative. The front was typically Glaswegian, so was the rear. Unfettered by 'Ancient Lights,' Campbell was free to run up sheer walls seven storeys high on a lane only eighteen feet wide. The glass wall helped his tenants, but not those across the lane. Openings of this size were only possible with a steel frame (which was not employed at the front) and a central heating system. Another peculiarly Glaswegian building was Salmon and Son and Gillespie's idiosyncratic Lyon Chambers. Beneath its vernacular roughcast facade was the most ruthlessly thin frame in office history, executed in Hennibique concrete. Lyon Chambers went farther than any other pioneer concrete office to explore the expressive possibilities of the material.

Steel framed offices far outnumbered concrete, but had few expressive triumphs. Burnet's Royal Insurance on Piccadilly was a taut, early expression verging on Mannerism. His later Kodak House was perhaps more memorable as a steel building, but carried on the tradition of a massive base and thick walls. The Phoenix Assurance was more representative of the general attitude toward the steel frame. J. MacVicar Anderson never attempted to express it.

Just as the City had been the scene of the most intense Victorian office building construction, Westminster became the centre of activity in Edward's reign. With large sites, wide streets and agreements to banish 'Ancient Lights' claims, office buildings could be built in unprecedented sizes. They incorporated sophisticated,
newly emerging technologies. The new streets of Kingsway and Aldwych offered the greatest and most publicised opportunities for new office construction. Although never quite living up to the stylistic hopes of the 1900 competition, these streets were expressive of the early twentieth century office building in ways that go well beyond mere style. Buildings for the new businesses—advertising, electronics, communication—were designed for scientific management on the open plan. The greatest number was designed by Trehearne and Norman: Empire House, India House, (7-14) Canada House, (9-64) Victory House, (9-66) and Shell Corner. (9-65) These buildings offered uninterrupted column free office areas, central heating, giant windows, general lighting, and often full structural frames. With their neighbour, Bush House, (9-70) they responded to the giant widths of Kingsway and Aldwych with giant scale, in Stripped Classic facades. Their consistent size and detailing brought a uniformity to the termination of the Kingsway, and showed the promise of a cohesive street architecture.

From the early house-like offices in the City to the monuments on Kingsway, the office building changed in a series of small, slow steps. The evolution over seventy-five years was never simple or direct. Important events were sometimes confused or controversial. Organising factors were often in conflict. Constituent elements were generally overlooked by an architectural press more interested in other, more stylistic issues.

The incremental change was difficult; the overall change was substantial. It recorded the messy vitality of the growing Victorian and early twentieth century city and set the office building on the threshold of our modern period.

What was the legacy of these office buildings?

The heroic qualities of the office building in late nineteenth
century Chicago are so constituent a part of our recent architectural
history that they invite a direct comparison. The Chicago phenomenon
lasted ten years. In a fire gutted city on the open prairie, business
demands and willing designers pushed office buildings to unprecedented
heights. The lift, electric lighting, and central heating were ex-
ploded; steel framing, thin walls and a new expression were invented.

The British reaction was emphatic. Chicago office buildings were
considered boisterous, ugly, light-blocking, lacking in 'truth' and
stability, and feats of engineering but not architecture. At their
worst, British office buildings were all of these as well. But at
their best, the evolving British office building must be seen as some-
thing richer and more complex: a response to modern needs within the
confines of traditional architectural values.

From the early years when Cockerell placed a public banking hall
behind his private house-like block for the London and Westminster
Bank, to the closing years when John Burnet expressed the steel frame
of Kodak House with sheer columns, but maintained stability through
three feet thick walls, office building architects constantly walked
a fine line between tradition and innovation. In doing so they
raised building heights a couple of storeys, increased glass area
modestly, developed compositional techniques to control proportions,
banished the open fire, and created the 'scientific office' plan.

Chicago office buildings are remembered because they were all
innovation; the formative British office buildings should be remember-
ed because they tempered innovation with tradition.