ISSN 1816-9554

Surveying & Built Environment

Vol. 31 Issue 1 ■ May 2022

THE HONG KONG INSTITUTE OF SURVEYORS
香港測量師學會
www.hkis.org.hk

Surveying & Built Environment

THE HONG KONG INSTITUTE OF SURVEYORS

Information

ISSN 1816-9554

THE HONG KONG INSTITUTE OF SURVEYORS
香港測量師學會

總辦事處 Head Office
香港上環干諾道中111號永安中心12樓1205室
Room 1205, 12/F Wing On Centre, 111 Connaught Road Central, Sheung Wan, Hong Kong
Telephone 電話: 2526 3679 Fax 傳真: 2868 4612
E-mail 電郵: info@hkis.org.hk Website 網址: www.hkis.org.hk

北京辦事處 Beijing Office
中國北京市海淀區高樑橋斜街59號院1號樓
中坤大廈6層616室 (郵編：100044)
Room 616, 6/F, Zhongkun Plaza, No.59 Gaoliangqiaoxiejie, No.1 Yard, Haidian District, Beijing, China, 100044
Telephone 電話: 86 (10) 8219 1069 Fax 傳真: 86 (10) 8219 1050
E-mail 電郵: info-bjo@hkis.org.hk Website 網址: www.hkis.org.hk

Editorial Board

Contents

Editorial

Two types of leftovers

In any human mind there is a huge void in knowledge. One vein in that void is one's lack of awareness of the extent of one's ignorance about the place in which one lives. Filling that void by studying the built leftovers of the past, a powerful aid for reclaiming the past, is a key step one should make in order to live better in the present and future.

From architectural leftovers, understood as heritage, and interpreted through knowledge transmitted by survivors, official records and written-up research, one may be able to reconstruct the past, although only partially and never fully. That way we gain present and future appreciation of what the past has to say to us, as it speaks through its relics.

Built WW2 military leftovers in Hong Kong, located mostly in a serene countryside setting, now unthreatening to anyone, are the signifiers for us of war and peace; life and death, international relations and local development; construction and demolition; etc.

The paper on fixed observation posts on Hong Kong Island and the two notes on the fort in Mount Parker and a puzzling structure in Hong Kong Park provide organised information that should help fill out our knowledge of overlooked built heritage conservation in Hong Kong.

Depending on further and better research, the essay on the recovery, by Cho Wing Yip in 2006, of a British military padlock left in a fire trench below the "artillery observation post" of Shing Mun Redoubt, may help corroborate evidence officially gathered about the fall of the Redoubt in December 1941.

In academia, most productive researchers have leftovers – papers unpublished in the "publish or perish" game, due to stubborn refusal to accommodate requirements of contemporary editorial or referee fashions. Students and young researchers may be able to find in these leftovers ideas and data of great value.

The work by Ben T Yu in this issue is just such an interesting intellectual leftover of the generation of US economists of the period from the late 1970s to the early 1980s in the wake of the big digital revolution within an enabling IP framework. 40 years have lapsed since the completion of this manuscript on IP. The author contends that this work is the best of his publications, i.e., better even than his well cited work (Yu 1981) on "prior contracting" accepted by Ronald Coase for publication in the *Journal of Law & Economics* in 1981.

The paper by Andersson on the English "planning disease" may inform us better on the current proposed revision of the

Town Planning Ordinance aimed at reducing time consumed by planning procedures. A blind spot is the limited life span of a planning permission, which used to be infinite, then 2 years, then 3 years and now 4 years, still far too short to deal with lease modification where needed.

References

Yu B T (1981), "Potential Competition and Contracting in Innovation," *Journal of Law and Economics*, 24:2, 215-238.

Surveying & Built Environment

Spontaneous Order, Entrepreneurship, and the English Planning Disease

David Emanuel Andersson[1]

ABSTRACT

A spontaneous-order approach in the tradition of Hayek and Polanyi offers a more realistic approach for interpreting market phenomena than conventional economic models of general or partial equilibria. The market order is inherently dynamic, and order arises because of institutions that help channel human action according to order-specific incentives and systemic resource feedback. In markets, market prices are the feedback and the systemic resource is money. However, unlike in equilibrium models, a spontaneous-order conceptualization is incompatible with the idea of top-down resource allocation. Instead, entrepreneurs continually discover more valuable uses of existing resources. Unified resource allocation plans tend to replace such discoveries, with inferior resource use as a predictable consequence. English land use planning after 1947 is an example of such anti-entrepreneurial planning, with numerous detrimental effects such as distorted land prices and a low level of innovativeness in the use of land.

KEYWORDS

Spontaneous order, entrepreneurship, information, land use planning, Hayek

INTRODUCTION

What do we mean by the word "market?" As it turns out, the colloquial meaning and the meaning in mainstream neoclassical economics are quite different. When we think of "a market" in its everyday sense, perhaps our inner eye envisions a bazaar, or perhaps a shopping mall. This is not at all the meaning that most economists

1 Associate Professor, IBMBA Program, College of Management, National Sun Yat-sen University, 70 Lien Hai Road, Kaohsiung 80424, Taiwan. Email: davidemanuelandersson@cm.nsysu.edu.tw

ascribe to the term. Instead, it refers to the aggregate of all exchanges of a specific good for money in a specific time period, and models of such markets rest on numerous more or less realistic assumptions. In "perfectly competitive markets," for example, a large number of sellers sell a uniform ("homogeneous") good to a large number of buyers, and all market participants have sufficient information and cognitive capacity to ensure productive efficiency, a uniform market price, and zero economic profits. The sellers do not do better (or worse) than breaking even, even though they maximize profits. The buyers are content with their quantity of consumption at the given market price, because the principle of utility maximization ensures that the marginal opportunity cost of each good equals its price.

But there is an older tradition within economics that views markets a bit more like the perception of the market participants themselves, albeit with a greater appreciation of the systemic indirect effects of market interactions. This view harks back to classical economics and Adam Smith's (1776) notion of "the invisible hand," whereby the interactions of market participants encourage a more efficient use of resources, greater division of labor, and a greater variety of consumer goods. This is a gradual process that takes time, unlike the static mainstream model that students first encounter in introductory textbooks. Thus in classical economics, a market is a continuously evolving process that may involve different numbers of firms, new production technologies, and new specialization as the economy develops.

Among government planners and property developers, it is the neoclassical view that predominates. The key spatial extension of the neoclassical equilibrium model is the monocentric model (Alonso, 1964). According to that model, different productive activities have different transport costs per unit of land area, which implies a spatial structure where land uses are separated from one another. The implication is that government planners can speed up the process of moving from a complicated and "suboptimal" reality of mixed land uses toward a theoretical ideal where every parcel of land belongs to a zone of complete specialization.

The problem with the monocentric model is that it ignores three real-world complications. First, not all activities are productive. Households are consumers of land, and consumer preferences are subjective. Thus households may encompass a wide variety location choices. Second, many types of productive land uses rely on the colocation of other land uses with which they interact. This gives rise to clustering of firms in complementary industries, relevant labor, and household services. Third, real-world markets do not possess all relevant knowledge at any point in time, and thus rely on entrepreneurs to discover new and better resource uses, including new uses of land. Thus land use is not static,

but evolves over time. The implication of these three complications is that *seemingly messy and disorganized land use patterns may be more efficient than a neat separation of land uses* that mimics the implications of the monocentric model. Later elaborations of the classical model do however allow for the theoretical inclusion of such real-world complications.

In the 20th century, the Austrian economist Friedrich August Hayek elaborated on Smith's original insight by viewing markets as a "spontaneous order." He adopted a term which was first used by Michael Polanyi to describe self-organization in scientific research (Polanyi, 1941; 1962). But it is clear that Hayek's use of spontaneous-order thinking predates his explicit use of the term. Already in 1945, Hayek wrote that

> [price] adjustments are probably never "perfect" in the sense in which the economist conceives of them in his equilibrium analysis. But I fear that our theoretical habits of approaching the problem with the assumption of more or less perfect knowledge on the part of almost everyone has made us somewhat blind to the true function of the price mechanism and led us to apply rather misleading standards in judging its efficiency. The marvel is that in a case like that of a scarcity of one raw material, without an order being issued, without more than perhaps a handful of people knowing the cause, tens of thousands of people whose identity could not be ascertained by months of investigation, are made to use the material or its product more sparingly; i.e., they move in the right direction. This is enough of a marvel even if, in a constantly changing world, not all will hit it off so perfectly that their profit rates will always be maintained at the same constant or "normal" level. (Hayek, 1945)

MARKETS AS SPONTANEOUS ORDERS

The "marvel" that Hayek is referring to in the quoted paragraph is the fact that markets exhibit an orderly structure of exchange relationships, even though no conscious plan has been formulated to pursue this. The market order is self-organizing. The decentralized actions of thousands or millions of market actors ensure that exchange ratios – market prices – will emerge. These prices distill decentralized information about relative scarcities in a multitude of interconnected localities. There is no shared goal that these actors are pursuing. They may have little in common, and may believe in different philosophies or religions, and yet their interactions cause a relative price to emerge that coordinates their actions.

This price reflects local knowledge about relative scarcities in specific places at specific times, which depends on network interdependencies among an enormous number of idiosyncratic producers and consumers. In the absence of perfect knowledge, we can no longer assume that all producers use the "best" technology or that all consumers know how to ensure equal opportunity costs at the margin. Everyone is striving to improve their situation, but as a rule they do not achieve an optimal production technology or an optimal "basket" of consumer goods. Still, market prices nudge them in the direction of greater efficiency, even if they never become efficient in the absolute sense of textbook models of market equilibrium. Take housing as an example. Empirical studies of housing markets show that there is geographical and cultural variability in the willingness to pay for various housing attributes. A house with a view of the sea commands a substantial price premium in many Western housing markets, often exceeding 20 percent of the total price (Mandell and Wilhelmsson, 2011). In some Asian markets, seaside locations are not associated with higher land prices (Andersson *et al*., 2012). In a globalizing world, a location with no sea view price premium offers up entrepreneurial opportunities for developers targeting a new market segment, for example high-income Western expatriates. In this context, we may note that a view of the sea commands a modest price premium in Hong Kong (Jim and Chen, 2009) but no price premium at all in Taiwan (Andersson *et al*., op. cit.).

The institutional foundation of spontaneous orders

How does this order come about? There are a few necessary conditions. First, in an approximate sense there must be agreement most of the time about who owns what, and these owners must for the most part be secure in the knowledge that the resources that they own will stay in their possession if they do not sell them or give them away. That is to say that there must be relatively well-defined property rights, and a legal system that protects holders of these rights. The people who are trading goods and services must know what they are trading – and how long they can keep what they have bought – in order for reliable prices to emerge. This implies that the vast majority of participants in a market must comply with the rules of property and contract. Rule-following is one necessary condition for the emergence and retention of a spontaneous order. The institutional foundation of the rule of law, which is present in all OECD countries but absent in many authoritarian or poor countries, is thus a necessary condition for a well-functioning spontaneous order.

The systemic resource of money

Another necessary condition is that there must be a systemic resource that spontaneous order participants seek to accumulate. In the market order, this resource is money. Accumulation of money signifies market success. Loss of money equals failure, and repeated losses imply exit. Thus bankruptcy laws are an essential component of

the spontaneous market order. The combination of a reliable legal system that protects property and enforces contracts, a stable currency that enables the emergence of prices that reflect dispersed local knowledge of scarcities and opportunities, and a set of buyers and sellers who follow the rules of the market are the necessary components. With these in place, a self-organizing orderly market becomes possible. And it is this that we refer to when we use the term "market order" as shorthand for the specific spontaneous order of interrelated markets.

The imperfection of all real-world market orders

It is clear however that real-world markets may reach different levels of conformity with the ideal. Perfection is not necessary for the emergence of a spontaneous order. It is more helpful to think in terms of thresholds, or in terms of market-specific flaws. The real spontaneous orders that we observe all have flaws, unlike the (unreal) neoclassical model of perfect competition. A legal system may for instance enforce property rights as a general rule, but it is never perfect. There may be boundary conflicts between neighbors. Some judges may have less than perfect integrity. Certain more efficient uses of a resource may violate government regulations. The list of potential imperfections is not a short one.

There is also the question of resource distribution. Remember that the demand, or the "willingness to pay," depends on more than consumer preferences. It also depends on the potential buyers' purchasing power, which reflects expected future earnings, current income, and accumulated assets. If this is limited to a tiny segment of the population, as is often the case for isolated (i.e. autarkic) markets in the least developed countries, it becomes impossible for prices to reflect more than a fragment of the local knowledge that is embedded in the most developed and globalized markets. If, as is often the case, the isolated small market is also embedded in an environment of unpredictable expropriations and untrammeled corruption, rule-following may become pointless. Thus in such a case the "market" is no longer a market in the sense of a spontaneous order, and the observable "market prices" may be as hopeless at directing human activities in more value-productive directions as the administered prices of *Gosplan* (i.e., the State Planning Committee in the Soviet Union).

The neoclassical model is a special case of the market order

In certain conditions, the spontaneous order of a market may resemble the market of a neoclassical equilibrium model, although it is unlikely to retain those features for more than a limited time period. A mature market for a popular and simple good with negligible economies of scale may resemble a perfectly competitive market, if we assume that it is embedded within a well-functioning institutional structure.

The market price may be almost the same, regardless of the seller. In fact, there may in fact be a single market price if one keeps all non-homogeneous factors constant, such as the relative ease at which buyers can reach sellers. It may even be the case that the sellers all are in the vicinity of the break-even point. All the numerous sellers sell a good that is identical or at least very similar, they all charge about the same price, and the cost of the inputs are approximately equal for everyone. One example could be the price charged for a non-descript inner-city apartment, as is found in many cities around the world. In a big city, thousands of standardized one-bedroom apartments may be offered in locations with similar accessibility and neighborhood attributes. Perhaps the apartments become a bit more expensive as one approaches the downtown area, which would be a predictable consequence whenever there is a price-distance gradient from the point with the greatest overall accessibility. Therefore, the price, shorn of its location-dependent component, may still be the same.

While this example may seem to rehabilitate the neoclassical equilibrium model as a good model for real-world markets, this is only occasionally the case. The key criterion here is whether market feedback compels market participants to act *as if* they have perfect information about relevant market prices. In a mature market for a popular standardized good with negligible scale economies this may sometimes be the case for the producer/seller, as in our hypothetical case of sellers of standardized apartments. However, even here the mainstream model is misleading on the consumer side of the market.

The spontaneous order framework puts order-specific feedback, and the information that the feedback conveys, at the forefront of the analysis. On the producer side, prices constitute feedback, and prices convey information about market conditions that nudge them in the direction of more efficient combinations of inputs such as raw materials, human capital, machines, and land. However, even more important is the fact that highly inefficient production techniques result in output prices and quantities sold (revenue) that cannot cover the costs of the inputs. The order constrains the producers in their choice of which mixture of inputs to use.

Consumers in the market order

Consumers face a more permissive market. True, they receive information when they observe market prices. However, the market does not punish consumers who make inefficient choices as buyers. They may rent the same overpriced apartment without receiving any feedback about their inferior choices, even if they could have rented a more spacious apartment at a lower price around the corner. One common example of this is when there are real estate agencies that target expatriates by using English, as opposed to cheaper agencies that only provide information in the local language. Consumer preferences are subjective, and the willingness to pay for an apartment reflect these individual preferences as

well as budget constraints, but there are also limits to how much each consumer knows. This imperfection of knowledge stems not only from unavailable information, but also from the cognitive limitations of the human mind, given the complexity of the economy and the time it takes to estimate the relative utility of a multitude of potential choices.

Inefficient consumers are not forced to exit the market. Therefore utility maximization is always misleading, unlike profit maximization, which the market order forces producers to approximate in those markets that resemble perfect competition. The psychologist Herbert Simon (1957) for this reason introduced the concept of "satisficing" to explain what consumers actually do. They aim for a situation that is good enough, rather than one that maximizes their utility. Later developments with a basis in psychological findings have shown that consumers may also use other strategies such as choices that reflect personal habits or gut feelings (Gigerenzer, 2008). Given the time and cognitive constraints that consumers necessarily face, there is nothing irrational about not engaging in an impossible task, which utility maximization is in all but the simplest choice contexts. The use of psychological findings as a starting point for understanding consumers' choices is compatible with spontaneous-order theorizing but not with the neoclassical default of utility maximization.

The role of the system constraint

In a path-breaking article, the Austrian economists Roger Koppl and Glen Whitman (2004) show that what really matters is the *system constraint* that an economic actor faces in a specific situation. In a competitive market, the producer faces a tight system constraint, and this implies that the real-world situation is reasonably similar to a neoclassical model for the producer. In less competitive markets, the system constraint is looser. Unlike our hypothetical landlord of a nondescript apartment, the monopolist faces a loose system constraint, although not quite as loose as on the consumption side of the market. The market order does not force a monopolist to restrict output in order to maximize profits. However, it does provide incentives to limit output. The system constraint only forces the monopolist to break even, at least in the long run (note that mainstream economics concedes as much in some models, with the concept of "X inefficiency"). Apart from the adoption of a somewhat inefficient production technology, the monopolist may also reduce output a bit more or a bit less than the optimal reduction from the monopolist's standpoint.

By way of example, a property developer may be the monopoly owner of land in a small and isolated location, such as a classic company town. As a monopoly land owner, the developer may charge higher sales prices or rents than would be possible in a large competitive market with dispersed land ownership. However, there is no compulsion to increase one's revenue beyond the break-even constraint. True, there is an incentive to increase rents or restrict

output beyond the break-even point, but whether developers respond to such incentives depends on their alertness and capabilities.

This describes the situation of a monopolist that faces buyers who choose what they want to consume. If there is a purchase guarantee, such as when a state both makes and buys its tanks, the system constraint all but disappears, and the "price" of an input may diverge dramatically from what would have been its market price.

So far, we have compared the market order with conventional mainstream models of markets, which are intrinsically static. However, the key difference is the more dynamic way of thinking that a spontaneous-order framework encourages. A producer in a competitive and, thus, atomistic market may face a choice situation that resembles that of a pure price-taker under perfect competition, but will she choose to remain in this market? The textbook model does not encourage this question, unlike spontaneous-order theory. With a process perspective, it becomes clear that producers are always trying to escape a tight system constraint. This brings us to the role of the entrepreneur.

MARKETS, PRICES, AND THE ROLE OF THE ENTREPRENEUR

With an assumption of perfect or sufficient knowledge, there is no role for the entrepreneur, since market participants are cognizant of market prices, efficient production technologies, and utility-maximizing consumption choices. If we instead assume imperfect knowledge, however, there is room for the entrepreneur as a key shaper of markets.

While in Hayek's writings the role of the entrepreneur is implicit and not the focus of attention, the Austrian economist Israel Kirzner (1973) adopted a Hayekian theoretical framework for explaining how entrepreneurs coordinate and transform markets. In the simplest case, assume that we have two separate markets with their own sets of buyers and sellers. It is then possible for the same good, for example a nondescript apartment with the same access to jobs and services, to have a different market price in each market, which in this case may correspond to two neighborhoods in the same city. The buyers and sellers may simply not have noticed the discrepancy in prices and the fact that sellers in one market are paying too much while sellers in the other market are receiving too little compared with the best attainable situation.

According to Kirzner (1973), the entrepreneur functions as the coordinator of previously separate markets. The entrepreneur is alert to and exploits profit opportunities arising from differences between buying and selling prices. In the simplest instance, she is a pure arbitrageur. If the entrepreneur buys apartments in the cheaper neighborhood, and then markets them in the dearer (but otherwise similar) neighborhood, she earns a pure entrepreneurial profit.

Such profits attract imitators, and these imitators will over time bid up the selling prices in the cheaper location, while the resulting increase in the supply in the dearer market will entail a gradual lowering of prices in that market. The end result is market integration and a single price for equivalent apartments. Note that this new larger market provides prices that reflect more dispersed local knowledge of relative scarcities than in the previous situation. Entrepreneurs thus act to increase the information content of prices as an indirect effect of their disproportionate alertness to profit opportunities.

However, it is not only arbitrage that integrates markets. Innovative entrepreneurship has the same effect. An alert entrepreneur discovers that it is possible to buy cheaper inputs that are transformable into a given output, or, alternatively, she may perceive that a given set of inputs may produce an output that is more valuable than what they are used for at present.

Many redevelopment projects are of this type. A harbor area may consist of old warehouses and obsolescent workshops. A property developer may discover that the use of the same land for waterfront condominiums, restaurants, and hotels may be associated with higher willingness to pay than existing uses. She may then attempt to acquire the land with the intention of converting old less valuable land uses, such as warehousing and small-scale manufacturing, toward currently more valuable uses such as residential, retail, and entertainment.

Innovation is thus also an entrepreneurial act that not only transforms or creates new markets; it is also an act that coordinates previously separated markets, thereby increasing the information content of the set of market prices, even if the increase is an incremental one.

Indeed, producers will only remain in a competitive market with zero or near-zero profits if they lack alertness or if they are in the market for other reasons than profit-seeking. The spontaneous order of the market offers high-powered incentives for breaking loose from a tight system constraint. If a landlord creates a novel product such as an apartment with sound proofing and triple pane windows in an area with low-grade building conventions – a product innovation – in response to her perception of a higher willingness to pay than the price of the inputs, she will earn an entrepreneurial profit if her perception of what consumers want is good enough.

The intrinsic instability of market structures

Depending on the disruptiveness of the innovation, the entrepreneur will either have created a new market or a new market niche. If it is a new market, she will in effect have become a monopolist until the time that imitators manage to enter the new market. If it is a new market niche, the market will have become less homogeneous, and thus will have moved in the direction of monopolistic competition. In a market with alert entrepreneurial innovators,

we can no longer regard the market structures associated with specific goods or services as fixed. Monopolies may originate from previous participants in competitive markets, and these monopolies may in turn evolve into oligopolies and then into a monopolistically competitive market with substantial product differentiation or, alternatively, into something resembling perfect competition due to the high substitutability of the competitors' offerings among most buyers.

The extent to which entrepreneurial opportunities present themselves to market participants depends to a substantial extent on the institutional structure. The dynamic market process perspective of spontaneous order theory therefore not only directs our attention to the role of entrepreneurs; it also directs our attention to institutions and, more specifically, to institutional reforms that may either expand or limit the set of entrepreneurial profit opportunities.

INSTITUTIONS AND ENTREPRENEURSHIP

We have earlier noted that the creation of reliable price signals is contingent on certain institutional prerequisites such as an impartial legal system, well-defined property rights, reliable contract enforcement, and widespread rule-following. The world's advanced economies – roughly speaking the OECD countries – provide an institutional framework that in a general sense provide serviceable price signals in most markets, but the details differ a great deal, and there are many exceptions that in some cases affect entire industries, as well as rules that prohibit or limit opportunities for entrepreneurial profit-seeking in specific areas.

An economic actor is the holder of a bundle of property rights to resources, which means that she can exercise control over all those attributes that are included in the bundle, including control over her own labor services (Barzel, 1989). Resources such as labor services and capital goods are heterogeneous; this means that they consist of an open-ended number of valued attributes. An attribute is not an objective aspect of a good, but instead refers to individual perceptions. A consumption good such as an apartment has attributes that correspond to the perceived satisfaction of various desires, such as being protected from hot or cold weather and enjoying al fresco dining on one's private terrace. Productive resources have attributes that reflect their perceived contribution to various consumption attributes.

As a more detailed illustration, consider a hotel room. The consumer of the bundle of consumption attributes that corresponds to a specific hotel room may be willing to pay for several of those attributes, such as shelter, comfort, safety, aesthetic beauty, and access to destinations in the neighborhood. The room may also give rise to production attributes, such as being a productive facility for job interviews.

While most goods and services are decomposable into several valuable attributes, it is common to distinguish four different types of property rights. Transfer rights refer to the ability to sell attributes or give them away. Income rights are the rights to derive income from them, as when one rents out one's apartment or one's human capital. Use rights signify the right to use attributes for consumptive or productive purposes. Exclusion rights refer to the rights of owners to decide the terms on which non-owners may use a resource. Transfer, use, and income rights can only command a market price if exclusion rights are effective.

An innovative entrepreneur may discover new and more valuable uses of existing resources. The owner of a hotel or a resort may for example discover that a new combination of facilities will result in a new unique ambience that should appeal to a certain niche. If it is a complex combination of factors, this ambience may be difficult to imitate or copy, which extends the profitability horizon. A resort may offer up a new design that combines restaurants around a square, sophisticated landscaping, and high-end specialty shops in a way that is costly and time-consuming to imitate for potential entrants in the same or similar natural environments.

Institutional obstacles

Nevertheless, there are in many instances institutional complications or limitations that hamper entrepreneurial ventures of this kind. Take the Swedish market for single-family housing as an example. According to Swedish building regulations – a set of industry-specific institutions – all homes that are higher than two stories must install an elevator. This raises the cost of building homes with three or more floors. An entrepreneurial discovery that some people may be willing to pay more than the cost of construction for a three-story house without an elevator has thereby been excluded from the entrepreneurial opportunity set.

There are often unforeseen indirect effects associated with this type of regulation. In the case of the elevator mandate, the main effects have been an increase in the proportion of structures with no more than two stories, and a parallel increase of those with at least five stories. Buildings with three or four stories have thus become less attractive (due to the unavoidable cost increase) than they would have been in the absence of an elevator mandate (Andersson & Andersson, 2014).

The elevator example is in itself trivial and in the grand scheme of things unimportant, but it serves as an introduction to a class of market interventions that have a substantial adverse effect on price formation and limits the efficiency-inducing features of the spontaneous market order. When regulations such as the elevator mandate multiply and become complex and multifaceted, it may lead to another unforeseen and unintended effect: fewer developers and less competition, with less affordable real estate as an important

consequence. In general, it is easier for large property developers than for small ones to absorb the costs associated with navigating the regulatory system. Large developers can hire teams of legal specialists, and they can also design several potential architectural proposals for a specific area in parallel. For small-scale builders, such a strategy would entail prohibitive costs. Thus, the most regulated markets tend to have the smallest number of competing property developers (Andersson & Andersson, op. cit.).

While regulatory complexity may make real estate less affordable for households and firms in most industries, it may be more profitable for property developers. Those developers that are large enough to shoulder the additional cost will tend to benefit, owing to a market structure that is more monopolistic than would otherwise have been the case. Oftentimes, developers benefit from above-average returns on investment in such markets (Andersson & Andersson, op. cit.).

Let us consider the abolition of many market features in the British market for real estate as a real-world example of regulatory complexity. This is especially interesting since other British markets have strong spontaneous-order characteristics.

THE ENGLISH PLANNING DISEASE

The starting point of the British system of planning was the Town and Country Planning Act of 1947. According to the Act, local and national planning authorities are jointly responsible for land use planning. Each local planning authority must formulate a local development plan according to national guidelines, and it must allocate every location to a specific use class such as housing, industrial, or commercial use. In many cases a "use" is narrowly defined as a specific industry or commercial activity. Each land use conversion requires a permit from the local planning authority. This includes minor changes such as transforming a clothing store into a restaurant or a single-family dwelling into a bed & breakfast. The local planning authority is obliged to take the local development plan into consideration when deciding on whether to grant a permit, but may deviate from the plan if they think there are good reasons for doing so. In practice, deviations are mostly denials of permits for land uses that are compatible with the zoning principles that constitute the foundation of the local development plan.

English planning practice shows that it is almost impossible to develop land in areas that were not classified as "urban" in the 1950s. The supply of land within each use class has also been inherited from the original classification. This means that public sector planners have determined the supply of land for each urban land use category, which has had the consequence that market prices that reflect the opportunity cost of the highest-valued alternative use of a plot

of land do not exist. The allocation of land to production and consumption uses thus proceeds according to the principles of a socialist planned economy as they were formulated more than sixty years ago.

Such laws were originally introduced to eliminate negative externalities associated with noise and pollution, such as when one puts a steel mill in a residential neighborhood. However, British practice extends far beyond the mitigation of air, noise, and water pollution. Still, it does benefit incumbent land owners, since the difficulty of initiating new development raises the market value of existing properties. In expansionary periods, the increase in demand for real estate results in higher prices rather than greater supply, since regulations ensure that the supply is less elastic than in a deregulated market. Thus many landowners, including most homeowners, have been able to benefit from substantial capital gains since the end of World War II. This has been at the expense of new entrants, such as in-migrants and immigrants, particularly in Southeast England.

In England, an even more restrictive policy was introduced in two steps in 1988 and 1996 by means of the Town Centre First policy (TCF). TCF stipulates that local planning authorities make detailed decisions about commercial land use in city centers, while implementing even greater obstacles than previously with the aim of preventing suburban commercial development. TCF also encompasses a "needs test" and "sequential test" for every proposed commercial project. An example of the needs test is that a person who wants to open a new grocery store must show that the neighborhood "needs" more stores and that the proposed does not adversely affect the competitiveness of existing stores in the same area. The sequential test requires the same person to show that there are no suitable city center locations before a suburban location can be assessed, and, additionally, that an exurban location can only be considered if there are no suitable suburban locations. There are in other words virtually no opportunities for creating shopping malls or even strip malls near freeways or in rural locations. For this reason, the last English shopping mall with freeway access (Bluewater) was established in 1999, and its permit hailed from before the introduction of the strictest version of TCF in 1996.

Proponents of this policy may have had the explicit goal of avoiding car-dependent development of the type that is all too common in the United States. From this (narrow) point of view, it would be possible to assess TCF as a success. Nevertheless, note that American suburbanization is itself the effect of another type of restrictive planning that mandates the separation of single-family homes with large lots from other types of land uses. In a way, it represents "planning failure" rather than "market failure." From that point of view, it may correspond to better planning, to the extent that the objective is to move away from car dependence. The problem, however, is not primarily downtown locations of

retail, but government planners' lack of understanding regarding markets. Markets rely on entrepreneurial discovery and experimentation, rather than on a centrally planned allocation of resources. In a roundabout way, British planning practice has incorporated many features of the neoclassical model, such as its assumption of sufficient knowledge and a stable configuration of productive activities.

The British urban economist Paul Cheshire and his group (2015) estimated that TCF reduced the total factor productivity of English supermarkets by 20 percent as compared with the period before the introduction of the policy. New supermarkets have been forced to locate in logistically difficult locations that provide less space for storing and selling goods. Newly established supermarkets were more productive until 1988, but have been less productive afterwards. The productivity decline did not affect supermarkets in Scotland or Northern Ireland, which were not affected by TCF institutions.

However, it is likely that the English planning system as a whole entails much greater efficiency reductions than 20 percent, largely because of the prevention of otherwise attainable entrepreneurial profit opportunities within a system with more reliable market pricing of real estate and land. American supermarkets have always been more productive than their British counterparts, and American productivity growth in the supermarket subsector of retailing was especially high in the 1990s (Haskel and Sadun, 2011).

It is not only potential entrepreneurship in retailing that English planning institutions have prevented. Urban growth boundaries have had similar effects on entrepreneurship in housing, commercial activities, and industrial location choices. A noted example is the Metropolitan Green Belt, which is a statutory green belt comprising a total of more than 5,000 square kilometers around London (about seven times the land area of Singapore). The only permissible economic activity within the Green Belt is agriculture, with the consequence that the (institutionally lowered) price within the area averages £7,500 per hectare, as compared with an estimated land value of about £7,000,000 per hectare with flexible land use (Cheshire, Nathan & Overman, 2014). Even in developed market economies, institutional constraints may prevent certain types of entrepreneurship from discovering more valuable uses of existing resources, while depressing the market prices of affected resources in extreme cases to as little as one thousandth of their free-market potential.

FINAL REMARKS

There are many advantages associated with putting on one's spontaneous-order glasses when thinking about real-world economic phenomena. It is a dynamic framework that sees the market as a process rather than as a snapshot or an optimal end state. Because people are seen as they are rather than as instantaneous optimizers with access to all relevant data, the framework also directs our attention to agents of

change and in particular profit-seeking entrepreneurs. Moreover, because the extent to which entrepreneurs can discover profit opportunities and/or act on the basis of these discoveries depend on the institutional structure in which she finds herself, there is but a small step to use this framework to focus on the supportive or distortive effects of institutions in various localities.

A better understanding of markets as a spontaneous order may also have enabled urban and regional planners to focus on what they do best, which is to provide physical infrastructure and to prevent environmental degradation in a way that *supports* the decentralized location decisions of entrepreneurs and households. Entrepreneurs continually reshuffle land uses as a result of discoveries of new higher-valued uses, and households are heterogeneous in their preferences and may in addition change these preferences in response to novel economic or social conditions.

I would like to end this paper with a table (see **Table 1**), which is an attempt to summarize the key differences between the neoclassical mainstream in economics and the spontaneous-order alternative, which for the most part coincides with the "Hayek-Kirzner research program" within Austrian economics.[2]

Table 1: **The Spontaneous-Order and Neoclassical Research Programs Sources: Adapted from Harper (1996) and Andersson (2008)**

	Research program	
Component	**Spontaneous order**	**Neoclassical**
Hard-core propositions		
Decision makers have perfect or probabilistic knowledge	No	Yes
Economic agents face structural uncertainty	Yes	No
Decision-makers are rational, however "rational" is defined within the program	Yes	Yes
Economic agents have the knowledge required for rational behavior	Yes	Yes
There is a strict tendency toward coordination of economic activities	Only if the system constraint is "tight"	Yes
Positive heuristics		
Construct dynamic theories in which learning is a real-time irreversible process	Yes	No
Apply the principles of methodological individualism	Yes	Yes
Construct single-exit situational models	No	Yes
Translate the situation into a constrained optimization problem	No	Yes

2 The term "research program" is used in the sense of Lakatos (1970).

REFERENCES

Alonso W (1964), *Location and Land Use,* Cambridge, MA: Harvard University Press.

Andersson D E (2008), *Property Rights, Consumption and the Market Process,* Cheltenham, UK: Edward Elgar.

Andersson D E & Andersson Å E (2014), *Byggmarknadens regleringar: ett hinder för Sveriges ekonomiska utveckling,* Stockholm: Entreprenörskapsforum.

Andersson D E, Shyr O F & Lee A (2012), "The Successes and Failures of a Key Transportation Link: Accessibility Effects of Taiwan's High-speed Rail," *Annals of Regional Science*, 48:1, 203-223.

Barzel Y (1989), *The Economic Analysis of Property Rights,* New York: Cambridge University Press.

Cheshire P C, Hilber C A L & Kaplanis I (2015), "Land Use Regulation and Productivity: Evidence from a UK Supermarket Chain," *Journal of Economic Geography*, 15:1, 43-73.

Cheshire P C, Nathan M & Overman H G (2014), *Urban Economics and Urban Policy: Challenging Conventional Policy Wisdom*, Cheltenham, UK: Edward Elgar.

Gigerenzer G (2008), *Gut Feeling: The Intelligence of the Unconscious,* New York, NY: Penguin Books.

Harper D A (1996), *Entrepreneurship and the Market Process: An Enquire into the Growth of Knowledge,* London, UK: Routledge.

Haskel J & Sadun R (2011), "Regulation and UK Retailing Productivity: Evidence from Microdata," *Economica*, 79:315, 425-448.

Hayek F A (1945), "The Use of Knowledge in Society," *American Economic Review*, 35:4, 519-530.

Jim C Y & Chen W (2009), "Value of Scenic Views: Hedonic Assessment of Private Housing in Hong Kong," *Landscape and Urban Planning*, 91:4, 226-234.

Kirzner I M (1973), *Competition and Entrepreneurship*, Chicago, IL: University of Chicago Press.

Koppl R & Whitman D G (2004), "Rational-choice Hermeneutics," *Journal of Economic Behavior & Organization*, 55:3, 295-317.

Lakatos I (1970), "Falsification and the Methodology of Scientific Research Programmes," in Lakatos I & Musgrave A (Eds.) *Criticism and the Growth of Knowledge* (pp. 91–196), Cambridge, UK: Cambridge University Press.

Mandell S & Wilhelmsson M (2011), "Willingness to Pay for Sustainable Housing," *Journal of Housing Research*, 20:1, 35-51.

Polanyi M (1941), "The Growth of Thought in Society," *Economica*, 8: Nov, 428–456.

Polanyi M (1962), "The Republic of Science: Its Political and Economic Theory," *Minerva*, 1:1, 54-73.

Simon H A (1957), *Models of Man, Social and Rational: Mathematical Essays on Rational Human Behavior in a Social Setting*, New York, NY: Wiley.

Smith A (1776), *An Inquiry into the Nature and Causes of the Wealth of Nations*, London, UK: W. Strahan and T Cadell.

Surveying & Built Environment

A Case Study of Prior Contracting in Innovations: U. S. v. Hartford-Empire Revisited

Ben T. Yu[1]

ABSTRACT[2]

This paper demonstrates a case where the licensor of a patent license performed much post-contractual development. The glass industry between 1916 and 1940 has utilized sequentially and predominantly two glass feeding principles—the P. N. Feeder and the Single Feeder. While considerable development on each machine was prior contracted, the Single Feeder did not appear to be covered by the license of its predecessor, the P. N. Feeder. For the type of post-contractual development prior contracted, the necessity of certain contractual provisions in patent licenses for its inducement is demonstrated. The analyses suggested an alternative way of viewing patent infringement prosecutions, the importance of examining the behaviors of the licensees, and the intention of the licensor to price discriminate over time. These considerations are uniquely implied by the theory of prior contracting, but have been hitherto neglected in past studies.

KEYWORDS[3]

Prior contract, transaction cost, innovation, Hartford Empire Case, P. N. Feeder, Single Feeder

PREFACE[4]

In 1980, I was an Assistant Professor in the Department of Economics at the

1 Department of Economics, University of California, Los Angeles. Email to contact the author: florne@nyit.edu

2 Added by Issue Editor.

3 Added by Issue Editor.

4 Added by author February 2022.

University of California, Los Angeles (UCLA). A celebratory conference was held for Ronald Coase. Many of the big names in the field of economics came to that conference. I was not an invited attendee. However, as privately instructed by Armen Alchian, I went to meet Coase, on his invitation, in his room in a hotel in Century City. He went over with me, one-on-one, for two hours, a draft of an article I had written, summarizing my 1978 Ph.D thesis. Several weeks later, Coase informed me that my article had been accepted for publication for the October 1981 issue in the Journal of Law and Economics (JLE). He recommended, however, that the title of the article be changed to "Potential Competition and Contracting for Innovation."[5] I did not accept that recommendation because I thought the preposition "in" was more inclusive of the ideas in that article, which, although containing a new concept that I had named prior contracting, was only one among many concepts I was writing about in that paper. Furthermore, I was already working on another paper that was intended to focus only on the notion of prior contracting, and I was hoping that that paper would be more suitable for the title of Contracting for Innovation. That paper was UCLA Working Paper No. 189, reproduced here. Another reason why I didn't want to highlight the notion of prior contracting for the JLE paper was that I wanted to pay tribute to my mentor, Steven N.S. Cheung, who was working on the idea of Ricardo's differential rent applied to innovations. I thought Harold Demsetz's idea on Potential Competition in his article "Why Regulate Utility?" was probably more appropriate than Ricardo's differential rent, so I thought the naming of my article in a way that could suggest a theoretical breakthrough that I thought should be highlighted. I wanted to feature two separate concepts in the JLE piece: Potential Competition and Contracting. Contracting is a tradition that Steven Cheung has emphasized for studying real world problems for many years. Paying tribute to his teaching in an article summarizing my thesis was important as the mainstream approach at that time was that patenting is just a monopoly pricing problem, not so much a contracting problem. Potential Competition and Contracting are two concepts entirely separable, and yet both can be applicable in the area of innovation. I wanted to sell my contribution as an amalgamation of two approaches (one abstract and one practical) in a field of study that had never considered a combination of the two approaches. I do believe that a combination of two separable concepts into one should be considered an innovation itself. It also more accurately captured the scope of my Ph.D thesis. However, that was a marketing mistake. Many people could be easily turned off by a seemingly improper use of a preposition, seeing it as the work of a non-native English writer who doesn't know English well. The natural instinct would be to not spend time reading someone who doesn't even know how to write proper English. Indeed, I had been warned about my writing style many times during my early years as a young economist, including on one occasion

5 Yu (1981).

at lunch at the faculty centre, when a senior colleague, who was the editor of Economic Inquiry kindly offered me advice. So when Malcolm Fisher pulled me aside and quietly said: "Don't listen to them", I was shocked. I didn't know then how the publication game was played by that comment. I still don't know now. My stubbornness on writing style was obvious in that Working Paper. I didn't know at that time that there was simply zero chance that a paper of that kind could be published. Now 42 years later, considering the emergence of contractual innovations such as Nonfungible tokens (NFTs) and carbon offsets mechanisms such as Advance Market Commitment, I would consider this to be the best paper of my life, and I'm grateful that this is published, thanks to Lawrence W.C. Lai, as is without the "normal" editorial editing, thus, most likely including many grammatical mistakes. I did not make any mistakes in concepts, however. This was how I would say it then. This is how I would say it now …..I was most likely thinking in Hong-Kong Cantonese when I wrote this article in 1980.

INTRODUCTION

The purpose of this paper is to examine the extent and the consequences of contracts for future developments in patent licenses (Barnett, 1926, Bowman 1973). Important innovations (Schumpeter 1934, 1974) are usually a sequential process, i.e., the early results can be incorporated in subsequent results. Even though the innovations may be patentable, patent infringement suits are often a timely process. With these assertions, I argued in previous papers that a manufacturer will be unlikely to contract with a patent holder who does no continuous research, partly because he anticipates another major idea displacing the existing one and partly because the incentive for the existing patent holder to fight an infringement suit will be less, and thus the probability of the manufacturer escaping the infringement charge is higher. This implies that, on the average, the ratio of patent infringement suits to patent licenses ought to be higher in relatively stagnant industries where the state of the art requires no drastic changes. Furthermore, in industries where important innovations are anticipated, and if the dominant inventor can be identified, patent licenses are likely to include the granting of future patents on improvement. The reason for the latter is that once a licensee has decided to contract (rather than to fight) with the patent holder, he would gain by contracting early rather than late. If negotiation with the patent holder can be conducted before his patent position has been strengthened, competition among potential inventors becomes viable and the package price of the innovation can be lowered. Such an arrangement has been called prior contracting. Stated succinctly, a manufacturer may either fight or contract with a patent holder; but if he chooses to contract, he would rather prior contract than to sign up late.[6]

An ideal test for the above theory perhaps requires inter-industry comparisons. Lacking the data (and the resources)

6 Patent licenses without a future improvement clause do exist, but the implication is that they should, on the average, be less frequently observed in industries where important innovations are anticipated.

to conduct this task, I examine a case study where innovation is known to be important. The Hartford Empire case has been selected because of my relative familiarity with the case,[7] but as it turns out, the case may not be that ideal because the driving force behind prior contracting, namely, competition among inventors, has been reduced by an enforceable collusion in this particular case. Still, there were outsiders to any collusive scheme. Even though some implications cannot be tested because of inappropriate circumstances or insufficient data, a discussion on the relevant variables that require examination hopefully can provide guidelines for future studies of other cases. This is not a complete case study in the sense that many aspects of the case are deliberately left out so that one can concentrate on the issue of prior contracting alone.

The paper will be divided into two sections. The first summarizes the implications relevant to the issue of contracting. The rationale behind the implications has been explained in the other papers. Section II examines the Hartford Empire case between 1916 and 1940. I argue that much of Hartford's conduct in the glass manufacturing industry has to do with their intention of doing additional research work in the field. This aspect of the case has not been fully addressed to in past studies of the case.

IMPLICATIONS RELEVANT TO CONTRACTING

Prior contract involves the licensor making a commitment to future development which the licensee will commit to accept. Two types of transaction costs are crucial in determining the extent and the form of a prior contract. First, there is the information cost of identifying and evaluating the potential abilities of different inventors. Variation of such cost over time as well as across manufacturers generates refutable propositions regarding the behaviors of the licensor and the licensees. Second, there is an enforcement cost to the future commitment. Without an appropriate incentive system, an inventor may not actually deliver the committed development once he has gotten the commitment from the manufacturers. If patent licenses are partially development contracts, we ought to observe some enforcement mechanisms specified in such license. Consideration of these two types of transactions cost generates the following implications.

Implications regarding the behavior of the licensor

Before the relative superiority among inventors (or models) is known, a licensor would price his innovation as if he is a monopolist. Information on the relative superiority among inventors may only be revealed after a period of price cutting, only the superior inventor surviving. This implication is often

7 The main sources of references are (a) the transcript of U.S. v. Hartford-Empire Co., 323 U.S. 386 (1945), hereafter called Transcript, (b) U.S. Congress, Temporary National Economic Committee Hearing (1939), Part 2, hereafter called T.N.E.C., and (c) Past studies of the case, see Bishop (1950), Brown (1966), Beck (1976).

taken for granted. However, without considering the commitment to future development in prior contracts, there is no reason to determine a priori whether price cutting or quality (development) improving would be chosen as a method to gain patronage.

Prior contracting can be more clearly tested when information concerning the relative superiority of various inventors is known. The effect of prior contracting is potential competition among inventors, which implies that changes in the market shares of alternative models (or inventors) would not affect the price of the surviving model. As explained elsewhere, this suggests a regression analysis with royalty per machine as the dependent variable, and time and the interaction of time and changes in the market shares of the models as independent variables. The theory predicts that the coefficient of the interaction term to be insignificant. However, actual testing of the implication may require a model of simultaneous equations because price cutting among different models when any inventor's superiority is unknown would result in changes in the market shares as well.

Implications regarding the behavior of the licensee

Prior contracting implies the licensees take on an active role in determining the terms of the license rather than reacting passively to whatever licensing policy is imposed on them by the patent holder. The more efficient licensees with lower search cost will prior contract early, leaving the inefficient licensees who sign up late with a lower or negative profit. This line of reasoning implies that the early licensees ought to have larger output and a faster growth rate than the late licensees. The reason for the larger output is based on the theory of search - larger manufacturers search more. The faster growth rate is based on Stigler's survival principle.

(c) Implications regarding the enforcement mechanisms

A running royalty rate based on the output of a consumer product has been hypothesized as an inducement mechanism for future development of innovation. This implies royalty per machine ought to increase as improvements were added on to the machines. Furthermore, since precommitment of certain expected future development is the essence of prior contract, one expects the royalty rate (bonus for the future development) to remain the same even if there is a "price war." A lowering of the "price" of the innovation is likely to come in other forms such as lump sum reduction.

THE HALFORD EMPIRE CASE

A mechanical process of glass manufacturing around 1920 concerned the mechanical process of feeding molten glass into formers; and from there, charges of glass are blown or pressed into different shapes. Initial research work on the feeding technique allegedly began in 1912 by a research

organization called Hartford-Empire,[8] but the first commercialized feeder of the company did not appear until 1916 under the name of Paddle Feeder (later called P.N. Feeder). From 1916 to 1923, the feeding technique had been constantly improved, based on the principle of the P.N. Feeder as well as on a different principle called plunger. Starting from 1923, the plunger principle gradually took over. Modelled under the name of Single Feeder, 15 such machines were installed in its first year. This number grew rapidly, and by 1941, 410 were in use compared to 214 for the next popular feeder.[9] There were other feeding techniques besides the mentioned ones. They were the air feeder, the stream feeder, the pneumatic air feeder. The feeding technique also competed with a pre-1912 principle known as the suction process. The alternative feeding techniques, owned by different individual concerns, mushroomed during the early history of the feeder's development but gradually disappeared from 1925 onward.

The events between 1923 and 1940 have been well recorded in previous studies.[10] Most widely publicized are (a) a series of patent acquisitions and cross licensing arrangements which enabled Hartford to threaten numerous manufacturers using "competing machines" with infringements suits, and (b) Hartford's restrictive licensing practices of leasing feeders to manufacturers on limited types of glassware, sometimes with quantity and geographical restrictions. Both are some forms of contractual arrangements, but the first type is formed among competing inventor (or research organizations) whereas the second type is formed between the inventor and the manufacturers in the industry.

The contracts among inventors (i.e., acquisitions and cross licenses) belong to a separate issue which is treated elsewhere. Most relevant to the subject matter on hand is the question concerning the extent of prior contracting (i.e., the second type of contracts) and its enforcement mechanism. However, this question may not be answered totally independently from the first. If the driving force behind prior contracting is competition among manufacturers and inventors, a collusive agreement among competing inventors would eliminate much competitive conduct. Still, there are always outsiders to any collusive arrangements, and the effect of competition, though greatly reduced, should be revealed to some extent. In the following paragraphs, I argue that Hartford's dominance has much to do with its continuous research effort. While many of these efforts were prior contracted, the precommitment of future research in patent licenses was reduced

8 The company was called Hartford-Fairmont in 1912. Its name changed to Hartford-Empire when it merged with Empire Machine Co. in 1916.

9 Ex. H-5749, Transcript, showed that the market shares of alternative machines declined while the single feeder gained considerable ground.

10 The glass container industry has been studied by a number of scholars in the past. This section will not duplicate their findings. Only evidence relevant to the issue in this paper will be presented. For other issues in the case, see Robert Bishop (1950), James A. Brown, Jr. (1966), Roger Beck (1976).

as Hartford's patent position was strengthened. This is a direct implication of the prior contracting view. In addition, certain contractual provisions in Hartford's patent licenses can be demonstrated to serve as enforcement mechanisms in such prior contracts.

To illustrate the type of improvements that can be made on a feeder, it helps to describe the basic components of a Single Feeder. It consists of (a) a forehearth, a channel where proper temperature of the molten glass can be adjusted, (b) a plunger, the reciprocating movement of which controls the shape of individual charges of molten glass, (c) an orifice ring, a hole through which gobs are fed, and (d) a pair of shears, which severs the suspended gob at the proper time. The co-ordination of these components is self-explanatory in **Figure 1**.

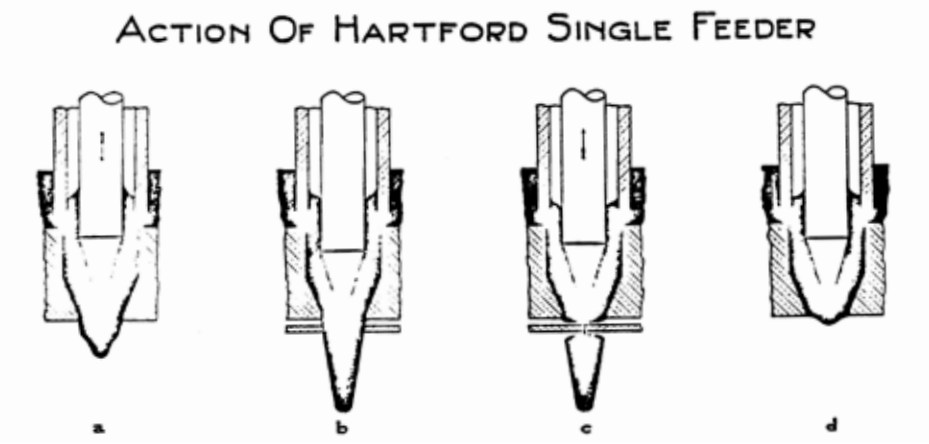

Figure 1: Diagram of operation of feeder, which delivers gobs of glass from the tank to the moulds of the forming machine in the gob fed process.

The functioning and the coordination of individual components of a Single Feeder have great variation. It was improvement of these components that constituted much of Hartford's post contractual development. Take the quality of glassware as one desired dimension, it is largely a function of proper temperature, viscosity, and size of the discharged molten glass in a feeder; and different wares have different optimal temperatures and "gob" sizes.[11] A versatile feeder is therefore needed by manufacturers serving multi product lines. This was accomplished by improvements on

11 Different glasses have different temperature and viscosity relationship and different machine cycles, see the testimony of Peiler, p. 7910. Improper temperature results in streaks and cords in the glass-wares see also Phillips (1941, p. 238).

the forehearth and on the controlling mechanism of "gob" sizes.[12] Take the quantity of glassware as another desired dimension, it is largely a function of the speed of the feeder, which is controlled by the coordination of the plunger and the shearing mechanism. Again, a great deal of improvement was performed on the coordination and the composition of the two components, resulting in significant increase in production.[13]

Besides improving particular components of the Single Feeder, Hartford is also known to have experimented with alternative feeding principles used in other machines. Moreover, such development works continued even after the patents covering these methods were acquired—an unlikely event if patent acquisition is purely for the sake of monopolization. As late as 1940, Hartford was still experimenting with the "double gob feeding technique," i.e., feeding two mold charges instead of one to a double cavity mold. This would double the speed of the Single Feeder (p. 8061). Another experimental venture had to do with the combination of an entirely different technique (the suction method) with the feeding technique. The suction method and the feeding method each had its own advantages and disadvantages, depending on the type of glassware and the quantity of the order. In 1930, roughly 30% of the glass containers were produced by suction with the rest utilizing some form of feeding technique (T.N.E.C. p.443 and p.772). But as early as 1915, Hartford had been experimenting with the so-called "suction gob feeding" technique, and judging from the issue dates of patents covering this method, the work continued until sometime around 1937 (Transcript, p.4476). As the chief engineer of Hartford, Karl E. Peiler, testified, the original intention of Hartford, was to aim at a universal feeder that could handle all types of wares. Unfortunately, this approach turned out to be unattractive after the trial runs around 1933, (ibid, p.4479). The dominance of the Single Feeder appears to emerge from repeated challenges from alternative devices.

12 One problem in the forehearth was "channelling." The phenomenon refers to hot glass coming from the melting tank, instead of gradually distributing throughout the nose of the furnace and coming out evenly to different feeders, it makes a bee-line between islands of stagnant glass. The result is that the temperature of the glass charge reaching the forming moulds cannot be controlled with great accuracy. The solution to the problem involved the addition of a revolving tube or sleeve around the plunger to air the glass in the feed bowl, the strengthening of the refractories, and the homogenizing of the glasses in a soaking section of the feeder, all these were added improvements after 1923 and continued up to the date of the trial. (See court transcript, p.8052 to 8059) Gob size is controlled by adjustment in the plunger and the sleeve surrounding the plunger. In particular, a device known as "phase change" shifts the time of occurrence of the shear-cut so that the length of time in which the glass is suspended may be varied or controlled. This will change the stretch and therefore the ratio of length to diameter of the charge. i.e., the shape of the gob, p. 4494.

13 Besides experimenting with different plungers (e.g., cam-operated vs pneumatic-operated), a stronger shearing mechanism must be built to stand the high speeds without vibration, to avoid throwing the glass and keeping the blades together to make a clean cut, p. 8061. Roughly speaking, there had been a steady increase in capacity of 50% between 1928 and 1939 in the quantity of glass obtainable from a tank of given size, T.N.E.C., Hearings, Part 2, p. 817.

The dominance of the Single Feeder must not be viewed as resulting from Hartford's patent acquisitions alone. There is no doubt that the patent positions covering the art of feeding were strengthened through acquisitions, but the proponents of this viewpoint should further ask: what explains who acquired whose patents? The testimony by Peiler gave convincing reasons for why it was Hartford who acquired others and not the other way around. What Hartford had repeatedly demonstrated is the fact that they had the comparative advantage in all feeding related techniques. Without such demonstration, it would be difficult to explain why a competitor would easily sell out his patent rights to Hartford. Competitors would not sell out, or might even acquire Hartford's patents, if each believed that his method would be most superior in the long run. They sold out because Hartford valued the continuous development of the competitors' methods more than competitors themselves—a necessary condition of any trade. As a matter of fact, many patent holders who sold out their patent rights wound up working for Hartford afterwards.[14]

The preceding argument has been largely neglected in the court and in past studies. This was a point the defense attorney for Hartford came close to saying. In his direct examination of Peiler, the court and the plaintiffs' attorney became impatient on the tedious questioning about the technical details of various techniques. The defense attorney tried to explain,

> "I want to show Your Honor the essential identity of the feeders which were developed and which were put on the market by various parties whom we are accused of suppressing, and so on…I want to show what that was in controversy between those parties, and I want to show that there was a similarity of method or of apparatus, and I can show it within an hour's time—It is not a patent infringement suit at all…," (emphasis mine) (p.4496)

Further elaboration on this point was never explicit. However, he came close to the point in the following page,

> "Now, I have shown partly of what the (Miller) feeder consists; has many parts …, and when you say "Miller Feeder" you mean only a feeder put out by Miller and not a feeder developed by Miller entirely. This single feeder here is not, in all aspects and all features, the work of a Hartford inventor, and we claim that a feeder cannot be properly referred to us, say a Miller, or Tucker, Reeves & Beatty Feeder. Although the word is descriptive, it doesn't describe what the feeder really was, what the contribution or central thought

14 The two notable ones were George E. Howard and W. J. Miller, the former sold out his patent rights in 1923, the latter sold out his rights in 1925. Their acquisition contracts with Hartford also specified transfer of future patents.

> of Miller, or Tucker, Reeves was, what they produced and gave to the art, which was more than just a box, or forehearth, or cams, that anybody could pick up on the market…"

The defense was clearly referring to the continuity of ideas. The impression was that the acquisitions have something to do with the sequential nature of idea, but not quite a patent infringement issue. However, what exactly is the reason for the contract,[15] and the question of who acquires whose patents has not been addressed at all.

Hartford's continuous research, which I just argued as the factor leading to its dominance, also explains their enormous patent expenditure. If future developments were not anticipated, there would be less incentive to set up an elaborate patent department specializing in patent applications and infringement suits, both of which involved large set up costs. The general impression in past studies seems to believe that Hartford's dominance was caused by their enormous patent expenditure. It is particularly easy to develop this type of sympathy by listening to the testimony of a small disgruntled licensee.[16] At the TNEC hearing, the President of Knape-Coleman Co. describes how he gave up fighting with Hartford vividly,

> "(Hartford) brought us unto court in April of 1935, as I recall. Well, when I arrived in San Angelo and met them there in the hotel, I can conservatively say there was a half train load of attorneys and equipment. There were motion picture projectors and attorneys all over the place. I don't know anyone of the Hartford legal staff that was not there. They were prepared to give us a nice battle. Well, I had only one attorney and he was considerable lost in that crowd. I wish you might have seen his face that morning. So, I promptly asked for a recess until the afternoon, in order to see if we couldn't settle the case out of court." [17]

The "tyranny" of a patent owner, however can be viewed differently. Consider the following question: Why didn't Knape-Coleman, or the owner of their machines, or Miller, or Howard, or any other competitors build the same patent department and thus be able to compete with Hartford's "tyranny?" It is almost a universal practice for a patent licensor to hold his licensees harmless against damages recovered in suits brought against the licensees by other patent holders.[18] The lack of such commitment is like selling a product without warranty, and can be easily inferred by the buyers as the

15 I attempted to answer this question in my doctoral dissertation (1978), summary argument is in Yu (1981).

16 The predecessor of Knape-Coleman was the Three Rivers Glass Co. who took out a license from Hartford in 1929, but cancelled in 1932 because of nonpayment, (see the record in Exhibit-5750, p.15436 Court Transcript).

17 T.N.E.C. Part 2, p.611, Knape-Coleman was formed around 1934. They took out a license from Hartford in 1935, but was recorded as a "financial failure" in 1936, see Ex-5750, ibid.

18 See the general study of patent licenses in Cheung (1976).

sign of a fly-by-night.[19] Conversely, the existence of such commitment must be backed up by a strong patent department which in turn signals future inventive potentials. Thus, uneven strengths of patent litigation power could reflect just uneven future inventive potential. Throughout the testimonies in T.N.E.C. and the court transcript, Hartford had emphasized that his licensees demanded strict enforcement of all infringers. Indeed, this may be explained in terms of licensees' demand for monopoly protection. Nevertheless, how is this different from a buyer of a product demanding warranty? How is this conceptually different from buying from firms that have large advertisement budgets and thick flashy carpets? Viewed this way, it is conceivable that the large litigation expenditure of Hartford is some sort of "brand name capital investment" required in situations where there is an honesty premium. [20]

One way to differentiate our view from the "tyranny" view of patent licensing is by observing the behaviors of the licensees. A totally passive glass manufacturer who started out using alternative machines would sign up with Hartford only if the latter exercised strong litigation threats and the patent owners covering such alternative machines gave up fighting with Harford. On the other hand, prior contracting views the licensees actively searching and comparing the future potentials of different machines. Thus, one should expect some manufacturers using alternative machines to switch to Hartford even in the absence of the litigation threat and before the patent holders of such machines sold out to Hartford. In other words, it can be the behavior of the licensees that determines the extent of the licensor's research effort rather than the other way around, (see section I, implication a and b). Machine installation records in the transcript suggested some of these cases (Transcript, Ex. H-6152, p. 8572). For example, the Carr-Lowrey Glass Co. had been using the Miller feeder prior to 1924. They switched to Hartford's single feeder before Miller sold out his patent rights to Hartford in 1925.

The behaviors of the licensees can also be examined in terms of their sizes and growth rates (see section I, implication (b)). Prior contracting predicts that the earlier licensees have larger firm sizes and faster growth rates. However, this test is inappropriate in this case for the following two reasons: (a) for any risky activity, the relative superiority of an individual can only be determined from numerous trials. The winner in a single race could be just lucky. This remark applies in the evaluation of inventors' superiority as well as the evaluation of the licensee's efficiency in his price searching behaviors. For the time period under investigation in this case, there was only one major innovation in the industry. Thus, classifying licensees based on the timing of their contracts with Hartford and inferring from this as to their efficiency in price searching may have a high degree of error. (b) The case under investigation also involves collusion among inventors. Behaving like a cartel, the superior inventor (Hartford) may hold firm to

19 This line of reasoning is similar to the one by Nelson (1974).
20 See Klein and Leffler (1981).

a high royalty rate and the licensees would lose their incentives to make prior commitments as the theory would predict. In fact, in such circumstances, collusion among competing inventors should provide a reverse incentive for the licensees to wait rather than contract earlier. The testing of prior contracting thus requires data before the date of collusion. However, this set of data would also be difficult to obtain since the court tends to overlook detailed evidence before collusion. A search among the exhibits in the court transcript discovered only market information after 1928. Classifying firms who took out licenses from Hartford up to 1932 as "early" and those signed up after 1932 as "late," comparisons of firm sizes and growth rates among these two groups did not reveal significant differences (see **Table 1**).

Table 1: Early and Late Licences Hartford

			Early Licensees (up to 1932)			Late Licensee (post 1932)			t-value of the difference
			$\bar{x}$	$\sigma_{\bar{x}}$	n	$\bar{y}$	$\sigma_{\bar{y}}$	n	
Firm Size	Small		111,424.6	46,896.1	10	109.251.3	51,053.1	7	.085
	All		1,138,209.4	2,874,568.7	19	638,566.8	1,270.651.8	16	.626
Rate of Growth (Mkt Share)	28 – 32	Small	-.03339	.1650	10	.0977	.1216	7	-1.680
		All	-.0057	.1308	19	.0784	.0937	16	-2.088
	34 – 38	Small	.1512	.2240	8	.0121	.0692	6	1.360
		All	.0722	.17726	17	.0480	.0719	17	.517
	28 – 38	Small	.0197	.1718	10	.0270	.0785	7	-.098
		All	.0199	.1297	19	.0670	.1151	18	-1.134

Calculations based on Ex. G.C.A. 6088, Transcript, (1928-1939). Small firms are defined as those that shipped less than 200,000 gross in 1928 on the East Coast. West Coast firms were not included because economic conditions and development of the market were different. The "small firms" are manufacturers who did little or no research. "All firms" include medium and large size companies who did research and development to various extents.

We now examine the contractual forms adopted in Hartford's patent licenses. The framework of prior contracting provides the following guidelines: (a) How much of Hartford's research was prior contracted? What changes in prior commitments are to be expected as the patent position of Hartford was strengthened? (b) What penalties a late licensee had to bear? Is there price discrimination over time? i.e., were the early licensees successful in getting a lower royalty rate while the late licensees were forced to pay a higher rate? (c) What enforcement mechanisms were used to encourage post contractual development? We examine these questions separately under the following headings:

Prior commitment of future development

In earlier paragraphs, we have described the research and development of various aspects of glass feeding techniques by Hartford. How much of such research was prior contracted is a crucial issue in our framework to analyze patent licenses. Recall the Single Feeder and its predecessor P.N. Feeder, the patent licenses of the two machines look quite different. The Single Feeder licenses have a standard form for all licensees, each license differs only in terms of the type (and sometimes quantity) of glassware permitted under the license. The P.N. Feeder license contains slightly different contractual clauses and its royalty rate differs from that of the Single Feeder. It also stipulates permitted types of glass wares.

The precommitment to future research was specified in both the Single and the P.N. Feeder licenses, but the scope of the precommitment seems narrower in the former than in the latter license. In a P.N. Feeder license granted to Thatcher Co. in 1920, Section II states,

> The Thatcher Co. shall during the term of such licenses be given the benefit of any/and all improvements upon the machines comprising said leased units which may be devised, developed or acquired by the Hartford …[21]

The term "improvement" had not been further specified. By contrast, the improvement clause in a typical Single Feeder license states,

> The word "improvements" when used in this license and lease, shall be held to mean only
>
> (1) substitution of new parts for old parts of said leased machinery, or (2) changing old parts thereof, or (3) addition of new devices which are intended and adapted to become integral portions of such machinery, and not otherwise.[22]

The narrowing of the precommitment of future research as Hartford progressed from the P. N. Feeder to the Single Feeder is perfectly consistent with the prior contracting view. Hartford's patent position on feeding techniques was much stronger during the Single Feeder era because the validity of their patents

21 Transcript, Ex. 231, p. 8907.

22 Hearing before T.N.E.C., Part 2, Exhibit 120, Section 8. See also license from Hartford-Empire to Florida Glass Mfg. Co. (1935), T.N.E.C., Part 2, Exhibit 118.

had survived the testing in successive infringement suits and because extensive patent acquisitions had reduced competition among potential inventors. Based on our reasoning, the incentive to prior contract is the strongest when the licensor's patent position is the weakest, for only then would the licensees be able to exert competitive pressure on the licensor in lowering his royalty price. This implies that the extent of precommitment to future development ought to be inversely related to the strength of the licensor's patent position. It is difficult to demonstrate this quantitatively in a case study. But one could easily imagine what would have happened had Hartford been able to contract with all the potential inventors. Our analysis predicts that the improvement clause in the patent licenses would be totally deleted in such situation.

An expected result which I have not observed among the data has to do with the transitional stage when Hartford switched from the P. N. Feeder to the Single Feeder. According to the wording of the P. N. Feeder license, the Single Feeder may be an interpretation of the Thatcher Mfg. Co., who had an exclusive right to produce milk bottles under the P. N. Feeder license.[23] When the Single Feeder first appeared, this interpretation became controversial. Hartford did not want the exclusive right to carry over to the single feeder license. However, the fact that Thatcher did possess negotiation power and the fact that additional milk bottles licenses were very difficult for other glass manufacturers to obtain suggested that Hartford must honor Thatcher's interpretation to some degree. Other P. N. Feeder licensees' relationships with Hartford were not fully documented in the transcript. Based on the little evidence on hand, it was not known that any preferential treatment or discount had been given to the P. N. Feeder licensees when they switched to the single feeder.[24]

Penalty of late licensees

The proposition that the early licensees can lower the innovation price before the licensor has patented his innovation implies that the late licensees have to pay a higher price if they sign up after the licensor has strengthened his patent position. This implication is again difficult to test directly. The license fees

23 Testimony by Smith, pp. 2046 (or 1028). Transcript. See also Exhibit 231, 234 and 237 in the transcript.

24 An example of an early licensee switching from the P. N. Feeder to Single Feeder is the Carr-Lowrey Co. The officer in this company had not been called to testify and its P. N. Feeder license was not included as an exhibit in the transcript. However, part of the single feeder license they obtained from Hartford was included as exhibit 1913 in the transcript which only gave the specification of wares allowed under the contract. I interpret this to mean that the rest of the contract was exactly identical to other single feeder licenses. The lack of the expected preferential treatment of the early licensees may have different reasons: Hartford may have reneged on their prior commitments because of the collusion scheme they had with other potential inventors. Alternatively, Hartford could have considered the invention of the single feeder as too drastic a departure from the P. N. feeding technique, see the distinction between anticipated and unanticipated innovations in Yu (1981) section II. Both explanations are suggestive and no further tests can be provided at this stage of my research.

of both the P. N. and the Single Feeder certainly exhibited a time path exactly opposite to the prediction. Namely, both the lump sum and the running royalty rates in the two feeders' licenses were noted to have decreased rather than increased over time. (See **Table 2** on the year a particular price component was cut). However, in analyzing the time paths, one must bear in mind that time is a proxy for more than one thing. Besides its use as an indication of the increasing strength of the patent position of the licensor, it also represents a gradual accumulation of information about any potential inventors' (or models') superiority. Without such information, prior contracting will be infeasible as one might wind up signing up with an overly optimistic inventor. As pointed out in section I implication (a), it is not unusual that under such a situation, the necessary information has to be sorted out by price cutting among various potentials inventors (or models). I suspect that was what happened during the P. N. Feeder era when the art of feeding was most crowded.

Table 2: Licence fees of P.N. Feeder and Single Feeder

Types of Feeder	Year	License Fee (i.e. lump sum)	Royalty
P. N. Feeder	1916 1918 1920 1926	$5500 6000 4473 4250	1st year $2250. Thereafter standard sliding scale depending on bottles size starting at 8¢
Single Feeder	1923	$2500	Sliding scale starting at 10¢ for bottles 2 oz. weight and under
	1936	2500	Rates on bottles over 2oz. were the same, but add a sliding scale for bottles less than 2oz. starting at 7.5¢ for bottles under ½ oz. wt.
	1937	2000	Same royalty rate

Based on Antitrust Transcript. Ex. H-5800

The time path of the single feeder is more difficult to explain. When Hartford successfully marketed the machine and when competing inventors (alternative models) gradually surrendered (sold out) after 1923, information concerning the superiority of any inventor (model) should be better known and prior contracting should be in force. This implies that the late licensees of the single feeder should be paying a higher lump sum and/or royalty rate. However, evidence suggested the contrary, Hartford had maintained the same lump sum and the running royalty of single feeder from 1923 to 1935, with only a decrease in the lump sum around 1935, probably caused by a decrease in the cost of building the Single Feeder.[25] The only late penalty I can detect is the infringement settlement late licensees often have to pay. The magnitude of the penalty cannot be directly estimated because the settlement often included a transfer of the physical machinery of the alternative model from the licensees to the licensor. Since there was no information on the value of the physical machines transferred, the nominal amount specified in the settlement contract should be interpreted only as net figure. It ranges from $150,000 (in the case of Ball Brothers Co.) to a negative $22,000 (i.e., licensee got paid by selling the physical machinery to Hartford) in the case of Lamb Glass Co.[26]

Aside from the accounting difficulties in figuring the late penalty, our analysis of late penalties is subject to another caveat. Patent acquisitions and cross licensing arrangements of Hartford no doubt signaled the comparative advantages of Hartford, and through a lowering of such information cost, the effect of prior contracting should be more obvious. However, the same arrangements of Hartford also have the ill effects of decreasing the underlying motive of prior contracting because competition among inventors would be reduced. In other words, while the transaction cost of prior contracting is lowered, the gain of prior contracting is also lowered. If the relative magnitudes of the two cannot be determined *a priori*, no prediction on the extent of late penalty can be made.

One puzzling aspect of the feeder licenses deserves some attention, and perhaps it reveals to some extent the intent of Hartford in charging a late penalty. Each feeder license specified the type (and sometimes quantity) of wares allowed to be produced by the licensees. The conventional interpretation of price discrimination does not seem to apply as Hartford has not charged different licensing fees for different glassware. Furthermore, this practice was used in the P. N. Feeder license as well as in the Single Feeder license. The P. N. Feeder era, recalled from previous discussion, is one when Hartford had not yet completely dominated the field of feeding. The inclusion of such restrictions during this period of time suggested its motivation is probably not related to collusion.

25 The construction cost of a feeder can be found in the Transcript.
26 Exhibits 199 and 152, 153. Transcript.

An alternative explanation of the restrictive provision described has to do with Hartford's motive in charging a late penalty, i.e., price discrimination over time. If the early licensees have no limitation on the type and quantity of wares produced, a late licensee can avoid the late penalty by contracting with an early licensee through a merger agreement and the ability to charge a higher demand price to the late licensees will be destroyed. With types of wares specified into the contract, Hartford can refuse to extend a licensee's product line when evasion of the late penalty is the underlying motive. Testimonies in T.N.E.C. as well as the court transcript also suggested that the type of wares specified is not truly "restrictive;" namely a licensee can request for additional wares or quantity, and they were usually granted.[27] It appeared that Hartford was using the restrictive clause as merely a safety-value.[28]

Enforcement mechanisms for the inducement of future development

The single feeder license has a lump sum license fee of $2500 (changed to $2000 in 1936) and a "Standard royalty rate schedule" as shown in **Table 3**. Obviously, the total royalty payment is a function of the size and the quantity of glass bottles produced. As explained in early paragraphs, much of Harford's post contractual development has the effect of increasing the speed of the feeder. The royalty rate is thus an incentive bonus—the licensor would be paid more if he made the machine to run faster.

27 Milk bottles and fruit jars were the two exceptions.

28 See the testimony of Smith in T.N.E.C. pp. 401-415. Describing the policy as to what type of wares were allowed, he said, "But as a general licensing policy, when a manufacturer came to us for a license, we said, what have you been making? What would you like to license for? And we would give him the license to make the particular glassware that he was manufacturing, selling, and marketing," p. 407. Elsewhere he described the general condition of the glass industry, "Now there are very few of the companies that make all kinds of ware. Many of the companies do a national business from coast to coast. Many are quite satisfied if they get a license from us to make three or four kinds of wares which is in a business that they know…and that is the license we give them…," p. 412.

Table 3: Standard royalty rate schedule of the single feeder license

The weights below specified are the weights of the finished articles.		
	Blown or Pressed and Blown	Purely Pressed
	Per Gross	Per Gross
$\frac{1}{2}$ oz. wt. and under	$7\frac{1}{2}$ Cents	$7\frac{1}{2}$ Cents
Over $\frac{1}{2}$ oz. wt. and not exceeding 1 oz. wt.	8 Cents	$7\frac{1}{2}$ Cents
Over 1 oz. wt. and not exceeding $1\frac{1}{2}$ oz. wt.	9 Cents	$7\frac{1}{2}$ Cents
Over $1\frac{1}{2}$ oz. wt. and not exceeding 2 oz. wt.	10 Cents	$7\frac{1}{2}$ Cents
Over 2 oz. wt. and not exceeding 4 oz. wt.	11 Cents	$8\frac{1}{4}$ Cents
Over 4 oz. wt. and not exceeding 8 oz. wt.	12 Cents	9 Cents
Over 8 oz. wt. and not exceeding 12 oz. wt.	13 Cents	$9\frac{3}{4}$ Cents
Over 12 oz. wt. and not exceeding 13 oz. wt.	14 Cents	$10\frac{1}{2}$ Cents
Over 13 oz. wt. and not exceeding 16 oz. wt.	15 Cents	$11\frac{1}{4}$ Cents
Over 16 oz. wt. and not exceeding 20 oz. wt.	16 Cents	12 Cents
Over 20 oz. wt. and not exceeding 26 oz. wt.	18 Cents	$13\frac{1}{2}$ Cents
Over 26 oz. wt. and not exceeding 30 oz. wt.	21 Cents	$15\frac{3}{4}$ Cents
	Per Pound	Per Pound
Over 30 oz. wt. and not exceeding 96 oz. wt.	$\frac{1}{12}$ of a Cent	$\frac{1}{10}$ of a Cent
Over 96 oz. wt. and not exceeding 128 oz. wt.	$\frac{1}{6}$ of a Cent	$\frac{1}{8}$ of a Cent

Purely pressed, that is, produced by an operation which consists solely of pressing without the intervention of any air in the mold for the purpose of changing the shape of the article to be produced.

The incentive function of the running royalty is not a pure conjecture. A study of the license of the single feeder's predecessor provides useful information on what the lump sum and the royalty is supposed to represent. In the contract between Hartford and Thatcher in 1920, Section 3 stipulates the licensee fee (i.e., the lump sum),

> The Thatcher Company agrees to pay to the Hartford Co. a license fee for each unit equal to the cost of the leased unit plus fifteen percent (15%) of said cost. Such cost shall be the actual and ordinary manufacturing cost incurred by the Hartford Company, including a reasonable overhead charge on that part of the cost incurred in the shop of the Hartford Company, but shall not include experimental or development cost as such, or the cost of designs and drawings. (Emphasis added) [29]

The P. N. Feeder also has a running royalty rate based on the quantity and sizes of the bottles produced. It appeared

29 Exhibit 231, Transcript, (p. 17287 or 8907)

that the royalty was the only way by which Hartford could recoup its research and development expenditure. In the single feeder license, the same wording cannot be found, but it is likely that the underlying motive behind its payment structure was the same as that in the P. N. Feeder license.

The incentive role of a running royalty also implies its relative rigidity when the licensor competes with other inventors (or models) in cutting the overall package price of the license. As shown on **Table 2**, the license fee of the P. N. Feeder varied over time and in general decreased while the royalty rate remained the same during the period. In other words, the licensor has committed to a "quantity" of future development (and thus requiring the same bonus payment), but competed to gain patronage by cutting "lump sum prices."

The incentive role of a running royalty also implies that the total royalty per feeder machine ought to increase over time as the machine becomes more and more efficient. An estimate of the total royalty per P. N. Feeder over time confirms the prediction, (see **Table 4**). Unfortunately, calculations cannot be made regarding the Single Feeder because royalty figures reported in the Transcript included all other feeders since 1923, and it is not possible to segregate the figure for the single feeder alone.

Table 4: Total royalty per P. N. Feeder 1916-1922

(1) Year	(2) * P. N. Feeders	(3) ** Royalty	(4) = (3)/(2) Royalty/Machine
1916	4		
1917	20	11,393	569.7
1918	39	81,689	2094.6
1919	46	135,964	2955.7
1920	64	237,901	3717.2
1921	73	288,576	3953.1
1922	74	330,438	4465.4
* From Ex H-5749 (or 15435)			
** From Ex. 415 (p. 15088 or 7928A)			

The leasing arrangement of Hartford's feeder provides still another clue to the enforcement mechanism adopted to induce future development. Unlike the owners of some other feeders, Hartford had never sold their feeders outright to the licensees. Such behaviors were considered by the Justice Department as most objectionable.[30] However, it is entirely possible that it is the licensees rather than the licensor who prefer the leasing arrangement. When a prior

30 The same arrangement was adopted by U. S. Machinery Corp. in the manufacturing of shoe and the IBM in the manufacturing of computer. Both were prohibited by the Justice Department. See United States v. United Shoe Machinery Corp. by Carl Kaysen (1956), the 1956 IBM Consent Decree in U. S. v. IBM Corp., U. S. District Court, New York, Civil Action No. 72-344. In the Hartford-Empire Case, the consent decree requires Hartford to sell the machine outright to anyone at "reasonable prices".

contract is signed, the licensee only gets a crude model with a promise by the licensor to further improve on it. If the licensee owns the machine outright, the licensor would have less incentive to honor the commitment since they have permanently parted with the machine. On the other hand, a leasing arrangement implies that the licensor retains partial ownership on the machine. Failure to deliver the expected improvement would decrease the value of the machine and thus provide the needed inducement for the committed future development.[31] An alternative explanation to the leasing arrangement is the licensees' risk aversiveness towards the obsolescence of the machine. However, this explanation is not totally independent from the one provided in the above paragraph. The risk of owning an obsolete machine increases if there are continuous improvements done on the machine. Since the licensor is the one that is doing the improvement, they must have better information about the probability distribution of future improvement than the licensees. Competitive free trade would thus result in the licensor (the more informed) bearing the risk even though both the contracting parties may have identical risk preference.

CONCLUSION

In this paper, I have demonstrated a case where the licensor of a patent license performed much post-contractual development. The glass industry between 1916 and 1940 utilized sequentially and predominantly two glass feeding principles—the P. N. Feeder and the Single Feeder. While considerable development on each machine was prior contracted, the Single Feeder did not appear to be covered by the license of its predecessor, the P. N. Feeder.

For the type of post-contractual development prior contracted, I have demonstrated the necessity of certain contractual provisions in patent licenses for its inducement. The analyses suggested an alternative way of viewing patent infringement prosecutions, the importance of examining the behaviors of the licensees, and the intention of the licensor to price discriminate over time. These considerations are uniquely implied by the theory of prior contracting, but have been hitherto neglected in past studies.

ACKNOWLEDGEMENTS

I wish to thank Duncan Cameron and Bruce Kobayashi for their assistance in research. Financial support from the Academic Senate, UCLA, and the Foundation for Research in Economics and Education are gratefully acknowledged.

REFERENCES

Barnett G E (1926), *Chapters on Machinery and Labor*. Carbondale and Edwardsville: Southern Illinois University Press. (Un-cited in the original manuscript)

Beck R (1976), "Patents, Property

31 The relationship between the leasing arrangement in conjunction with the unit royalty rate and R & D was also mentioned in Kaysen, Ibid, pp. 190-91.

Rights and Social Welfare: Search for a Restricted Optimum," *Southern Economics Journal*, 43, 1050-1054.

Bishop R L (1950), "The Glass Container Industry," in Adams W (ed.), *The Structure of American Industry*, New York: MacMillan.

Bowman W S Jr. (1973), *Patent and Antitrust Law*. Chicago: University of Chicago Press. (Un-cited in the original manuscript)

Brown J A Jr. (1966), *Antitrust and Competition in the Glass Container Industry*, Doctoral Dissertation, Department of Economics, Duke University.

Cheung S N S (1976), *Contractual Arrangements and the Capturability of Returns in Innovation: Report of a Pilot Investigation*, mimeo, Institute of Economic Research, University of Washington.

Kaysen C (1956), *United States v. United Shoe Machinery Corp.: An Economic Analysis of an Anti-Trust Case*, Cambridge, Massachusetts: Harvard University Press.

Klein B & Leffler K (1981), "The Role of Market Forces in Assuring Contractual Performance," *Journal of Political Economy*, 89:4, 615-641.

Nelson P (1974), "Advertising and Information," *Journal of Political Economy*, 81:4: 729-754.

Phillips C J (1941), *Glass: The Miracle Maker,* New York: Pitman Publishing Co.

Schumpeter J A (1934), *The Theory of Economic Development*. Cambridge: Harvard University Press. (Un-cited in the original manuscript)

Schumpeter J A (1974), *Capitalism, Socialism and Democracy*. New York: Harper & Brothers. (Un-cited in the original manuscript)

U.S. Congress (1939), *Temporary National Economic Committee Hearing*, Parts 2-3.

U.S.v. Hartford-Empire Co., 323 U.S. 386 (1945)

Yu B T (1978), *The Economics of Patent Pool: The Capturing of the Return to Basic Research*, Doctoral Dissertation, Department of Economics, University of Washington.

Yu B T (1980), "Patent Licenses as Development Contracts: An Alternative View," UCLA Working Paper.

Yu B T (1981), "Potential Competition and Contracting in Innovation," *Journal of Law and Economics*, 24:2, 215-238.

Surveying & Built Environment

Fixed Observation Posts on Hong Kong Island

Stephen N.G. Davies*, Lawrence W.C. Lai** and Y. K. Tan***

ABSTRACT

On Hong Kong Island some twenty fixed observation posts (OPs) were built to assist in monitoring enemy movement and in the direction and control of artillery. Little is known about these structures, no plans having survived the Second World War. This article reviews the possible design provenance of the OPs, distinguishes them from the pillboxes (PBs) with which they are sometimes confused, summarizes the sources of our knowledge of the OPs and their purposes, and establishes a clear typology related to design and location, tentatively relating these to different episodes in pre-war Hong Kong defence planning.

KEYWORDS

Observation posts, flash spotting, pillboxes, Battle of Hong Kong

INTRODUCTION

The purpose-designed and built observation posts on Hong Kong Island, referred to in the website Gwulo as "artillery observation posts", are smaller than, but often confused with World War II pillboxes (PBs) (**Lai**, **Tan** & **Davies 2021**). The common Hong Kong descriptor has often accordingly been abbreviated to 'AOP', but this is a very misleading usage, since formally 'AOP' in the sphere of artillery operations in the World War II British Army, meant an Air Observation Post, i.e., an observation

* Honorary Professor, Department of Real Estate & Construction, University of Hong Kong. Email: stephen.davies79@gmail.com
** Professor, Department of Real Estate & Construction, University of Hong Kong. Email: wclai@hku.hk, proflawrencelai@gmail.com, F.H.K.I.S., F.R.I.C.S.
*** Teaching Assistant, Department of Real Estate & Construction, University of Hong Kong. Email: tanyk@netvigator.com

post in a low flying light aircraft.[1] AOPs were still in development in 1940 and there was no AOP squadron in 1941 Hong Kong.[2]

The standard acronym was simply OP (Observation Post) qualified, when it was, by a broadly descriptive geographical location, for example High West OP, more rarely by its major user, for example WGRA OP (Western Group Royal Artillery OP), or occasionally more cryptic qualifiers. For the last there is the uncertain "Rose OP", which from Fortress Message Log data suggests yet another possible alternative designation for Middle Gap/Mount Nicholson.[3] And there is the hitherto entirely unknown "Bank OP", as to the identity or location of which there are no clues. Even the transparently geographical designations cannot, of course, pinpoint an actual location, merely offer an area within which map, aerial photograph and fieldwork searches can eventually identify a specific location and any surviving structure or ruins.

The OPs were, or at least would appear from the record to have been primarily concerned with assisting in the effective use of mobile, or field artillery in interdicting enemy movements and in counter battery fire against enemy artillery. However, some of the data from the Fortress Message Log indicates that, in addition, most of the OPs gathered and reported more general intelligence about enemy movements in their observed area to command headquarters.

These permanent OPs are to be distinguished from two other sorts of OPs that were also part of the defensive system. The first were the observation posts specifically tied to the fixed coastal defence and anti-aircraft batteries, which had their own battery observation posts (BOPs). The second were the usually more temporary OPs, comprising the troop commander and an assistant, that each field (in principle mobile) artillery troop would use to direct the fire of its own troop's guns.[4] However, it should be noted that all such OPs, fixed or temporary, were tied-in to a common artillery signals net for communications purposes, under the Royal Artillery's

1 **Parham & Belfield (1956)**.

2 The Hong Kong 'AOP' acronym stumbled into being largely by accident, since it was initially simply a label used to organize data by an early and prolific student of Hong Kong's WW2 built structures, Robin Weir. The reference to an "artillery observation post" at Shing Mun Redoubt by **Muir (1961**: **91**, *99*, **101**), as well as the widespread use of that general descriptor in the literature probably influenced the choice, though the use of the acronym appears exclusive to Hong Kong war studies.

3 What is styled here the "Fortress Message Log" has a most curious provenance. In around 2000 or a little earlier Dr. Tony Banham was introduced to an American gentleman (Richard Hinkle) who lived on Shouson Hill and was about to return to the USA. He said that a document had been found in an attic of a pre-war building nearby when it was demolished, and he had received it and typed up the contents. He gave Dr. Banham a copy. The whereabouts of the original is unknown. The contents of the transcription make it highly probable, indeed almost certain that the document is authentic.

4 This is a complex topic. In 1941 British field (i.e. mobile) artillery units were organized into 'regiments' (the equivalent of infantry battalions), comprised of batteries which had troops of guns organized into sections and sub-sections. How many batteries, troops and sections depended on whether the guns were light (field); medium, heavy or super-heavy.

"Unity of Effort" principle, which aimed to ensure the necessary weight of artillery support could be brought to bear wherever it was needed.[5]

FIXED OBSERVATION POST DESIGN PROVENANCE

As yet we have no clue as to the design provenance of these OPs, there seeming to be nothing like them elsewhere in known British and British Commonwealth WW2 defence structures. Whether there may be something to be gleaned from the designs of the Directorate of Fortifications and Works (FW3), that was set up at the British War Office in May 1940, we have not yet determined. However, the late date of the establishment of FW3, in comparison with the probable date of construction of Hong Kong's fixed defence systems, would make the direction of any influence uncertain. Known OPs in the British anti-invasion fixed defences are noticeably different.[6]

Little definitive can thus be said about the designs of Hong Kong's fixed observation posts. The evidence, such as it is, suggests that Hong Kong Island's OPs are *sui generis*. They were most probably a product of the garrison Royal Engineers and Royal Artillery getting together to decide, given contemporary British fixed fortification thinking, what would work best in the context of the perceived needs of Hong Kong's defence planning and Hong Kong Island's demanding topography.

There is no question that Hong Kong's examples are utterly distinct from OPs that were designed and built in Singapore as part of a combined observation post-cum-pillbox cluster[7]. Some have argued these were based on the contemporary Naval Type 1 US Navy design[8]. Far more likely is a derivation, following from the British WW1 standard Moir Pillbox, and provoked by the need for urgent remedial action in the mid-1930s resulting from long delayed follow-up on the May 1928 Gillman Report[9]. The Singapore examples may also have been designed for modular construction, which was certainly used when the designs were copied and used during the rush to build effective coastal defences around Darwin, Australia in 1942 (**Parks and Wildlife Commission of the Northern Territory**, **2016**).

However, whilst no direct design similar to the fixed OPs in Hong Kong has been

5 For an excellent guide to the detail of the British WW2 Royal Artillery's organization and systems, see Nigel F. Evans superb website: https://nigelef.tripod.com/directory.htm.

6 See, for example, that at Walberswick, Suffolk, shown at https://www.geograph.org.uk/photo/4087107.

7 https://remembersingapore.org/2020/04/30/singapore-pillboxes-history/

8 https://www.loc.gov/resource/hhh.hi0558.photos?st=gallery

9 TNA MUN 7/432, Oldham 2014, pp.37 and Appendix 2. For Singapore, **Air Historical Branch of the Air Ministry** (**nd**), 4-15; **Lee** (**2011**), slides 51-58; and **Ong** (**2003**). **Ong** points out (49) that even under the Gillman recommendations the Singapore beach defences were not scheduled to be built until 1931-32. They would seem by inference mostly to have been in place by 1936 (79) and, according to **Farrell** (**2015**) (35) "more or less complete" by 1939.

found, a careful review of all the fixed observation posts built in the British sector of the Western Front during the First World War shows certain very clear pointers.[10] The clearest is the practice of having the narrow observation slit around a corner (**Oldham 2014: 39, 44, 116**), as shown in the photos in **Appendix 1**. Perhaps most interesting here is the design of an overrun and intact German *Mebu* (*mannschafts eisenbeton unterstände*[11]), the ground plan of which is almost identical to that of the Type 1 OPs described below (**Oldham 2014**:**79**), and which may have influenced some British thinking (**Oldham 2014**: **279**).

In addition, as **Oldham** shows, there were known reinforced concrete, machine gun posts (PBs) in which a heavy sloping overhead cover above the firing loophole was used, exactly as we find in both Type 1 and Type 2 OPs in WW2 Hong Kong (**Oldham 2014**:**105**). Indeed, something similar seems to have been fairly regularly used by both sides in fixed OP design during the course of WW2.

In addition, fixed OPs were a feature of the live firing ranges used for intensive British artillery training in the 1920s, examples of which still survive today[12] . These, whilst clearly different from any Hong Kong fixed OP, share the basic design of the narrow observation slits with a massive structure above.

In short, whilst their design is almost certainly *sui generis*, the basic ingredients used in coming up with the solution to Hong Kong's unique defensive needs and steep, rocky slopes can all be seen to have been developed during World War 1 and to have become a fixed part of standard British fixed field fortification engineering practice.

RESEARCHING OPs

Exactly *how many* fixed observation posts there were on Hong Kong Island that had been built as part of the permanent defence system by the date of the start of the Battle of Hong Kong is extremely hard to establish. There are two primary sources for at least drawing up some indicative data. The first is the planning materials for the *1936 Hong Kong Defence Scheme* held in Britain's National Archives, which include a map, though that is only indicative, since we do not know to what extent what was planned was actually built.[13] The second is rare surviving written material from the Battle of Hong Kong.

As with so much of Hong Kong's abandoned and neglected wartime built structures, this surviving documentary evidence for the fixed OPs is both patchy and not very coherent. There is no single source that clearly and unequivocally lists all the OPs. The best we have seems to suggest anything up to twenty OPs, divided between what were identified as 'low level' OPs, with no clarity as to what range of heights from sea level

10 **Oldham** (**2014**) is the definitive source on the WW1 origins of British concrete defensive structures.
11 Reinforced concrete personnel shelter.
12 https://historicengland.org.uk/listing/the-list/list-entry/1021036 and /1021029
13 The authors are grateful to Mr Robin Weir for making copies of these available.

upwards constituted 'low level', and 'upper level' OPs, which seem in general to have been above 150m. Of these, in the *1939 Interim Defence Scheme*, there were to be six upper level and six lower level for flash spotting. As **Table 1** shows, either this plan was never fully realized, or there are upper and lower level OPs that have left no trace in the Battle of Hong Kong records. Collating all documentary mention of named OPs delivers a total of twenty on Hong Kong Island, the locations of most of which are either broadly identifiable or can be roughly guessed at, with the exception of "Bank OP".

We may note in passing here, and reflecting on our own work over the last decade and a half, that attention to the details of the design and construction of the defences on which the fortunes of war so often hinge has seldom been of significant interest to mainstream military historians. In consequence, the paucity of data over such things as designs, numbers, dates of construction and exact locations is one of the major stumbling blocks of this kind of enquiry.

As noted, therefore, whether **Table 1** is a complete list we do not know. One possible source of doubt is an entry in Major John Monro's diary. In his entry for 24 December, 1941, he observes,[14]

> "All the Hong Kong (and Singapore Royal Artillery) Regiments O.P's were officially sited for their view over the beaches; for fighting on the island itself they are in many cases quite useless."

Quite what to make of this we are unsure. Of the OPs identified in **Table 1** below, quite certainly not all faced the beaches on the south of Hong Kong Island, although that may merely have meant that all OPs facing north, which, as we shall see, were dedicated to flash spotting, were manned by the regular Royal Artillery specialists of one of the Survey Companies. The puzzle here is that the standard orders of battle for the British Army in Hong Kong in 1941 do not list any members of the Royal Artillery's specialist surveyors, and certainly no Survey Company. Given that it was only the fixed coastal and anti-aircraft batteries that were manned by the regular Royal Artillery, this argues that adequately trained flash spotting personnel must have been drawn from the ranks of either the HKSRA or the HKVDC. If so, that then makes Major Monro's observation about ALL the HKSRA OPs facing south clearly false. This is typical of the quality of data that often bedevils getting to grips with the fine detail of the Battle of Hong Kong and its fixed defences. Happily, it also allows us to conclude that worries about the level completeness of **Table 1** should not be exaggerated.

The *names* of the OPs we have come across are not consistent between all sources. In addition, twenty-first century Hong Kong researchers seem sometimes

14 The authors are grateful to Dr. Tony Banham for providing us with a digital copy of an edited transcript of Major Monro's diary.

to use names with little reference to contemporary, Battle of Hong Kong data. **Table 1** has a list of known names with their most likely alternates, though it is possible that a supposed alternate was actually a non-fixed, separate battery OP associated with a known nearby battery position. How many in the list were the sort of stoutly built concrete structures that have hitherto been styled "AOP" we have not yet been able to definitively to determine. Our work hitherto, which will be addressed in the remainder of this short article, reviews eleven structures that we have firmly identified from mapping and aerial photography data and have visited in the field.

Table 1: OPs on Hong Kong Island mentioned in WW2 documentary sources

No.	OP name (LL/UL)	Possible alternate	Known other description	Sources
EAST GROUP				
1	Pottinger Peak (UL)			1939 Interim Defence Scheme (FS) Fortress Message Log Monro diary (arty OP, 3 Bty HKSRA)
2	Saiwan (Old Redoubt) (UL)			Maltby Report Fortress Message Log
3	Shaukeiwan (Shau Ki Wan) (UL)			Fortress Message Log
4	Mount Parker (HL)			1939 Interim Defence Scheme (FS) Fortress Message Log
5	Braemar (UL)			1939 Interim Defence Scheme (FS)
6	Red Hill (LL?)			1939 Interim Defence Scheme Monro diary (arty OP 3 Bty HKSRA?)
7	Mount Butler (UL)			Fortress Message Log
8	Jardine (UL)		Jardine's Lookout	1939 Interim Defence Scheme (FS)
9	Stanley Mound (UL)			1939 Interim Defence Scheme Monro diary (arty OP, 3 Bty HKSRA)
WEST GROUP				
10	Mount Nicholson (UL)	Rose (Rosary Hill?)	Middle Gap	1939 Interim Defence Scheme (FS) Fortress Message Log

11	Wanchai Gap (UL)		WGRA HQ	1939 Interim Defence Scheme (FS) Monro diary (WGRA HQ)
12	Middle Spur (UL)			Fortress Message Log
13	Kennedy Road (LL/ UL)		Special OP	Maltby Report
14	Dockyard (LL)			Fortress Message Log
15	Matilda (UL)			Fortress Message Log Monro diary (4 Bty HKSRA)
16	Bank (LL?)			Fortress Message Log
17	Mount Austin (UL)			1939 Interim Defence Scheme (FS)
18	Victoria Peak (UL)		Command OP	1939 Interim Defence Scheme Maltby Report
19	High West (UL)			Fortress Message Log Maltby Report Monro diary (4 Bty HKSRA)
20	PB69 (LL)	Kennedy Town	Special OP	1939 Interim Defence Scheme (FS) Fortress Message Log
(FS) OPs shown in the 1939 Interim Defence Scheme as used for flash spotting[15] in counter battery fire.				

Of that list of twenty possible candidates, the physical remains of only eleven of the 'standard' OPs have so far certainly been found. An anomalous pair of additional possible OPs at Shaukeiwan, and in Hong Kong Park (part of the former Victoria Barracks) below Kennedy Road are possible extras, but these are treated in separate field notes and not discussed here. Dockyard OP is possibly the known pillbox 59 on the end of the mole of the tidal basin, although Robin Weir's analysis tends to rule that out, since all observed elements are thought to be for machine guns or searchlights. It is possible, however, that the Dockyard and PB69 OPs were of the same type and with the searchlight positions serving a daytime OP function.

All of the eleven standard OPs have now been visited by the authors. The diagnostic aerial photographs used to pin down positions appear in the second column of **Table 2**. In the final column of **Table 2** is a short classifier to distinguish the various examples. We shall dilate further on this in a typology to be presented below.

15 Flash spotting was used during the Battle of Hong Kong, with some success according to Major Monro. It appears to have declined in importance during the subsequent course of the war.

Table 2: OPs on Hong Kong Island so far physically identified as surviving

No.	Name (Figure no. in Appendix 1)	Survey map (Aerial photo)	Classifier
1	Stanley Mound (Figure 1 to 4)	15-NE-7C, December 1999 (Hunting Surveys Ltd. aerial photo No. 6556, 1 February 1963)	two apertures
2	Pottinger Peak (Figure 5 to 8)	215-SW-8, November, 1968 (Hunting Surveys Ltd. aerial photo No.6881, 1 February 1963)	two apertures
3	Mount Parker (Figure 9 to 12)	(Hunting Surveys Ltd. aerial photo No.8043, 6 February 1963)	single, corner aperture with widened viewing arc
4	Braemar Hill (Figure 13 to 18)	600 197-SW-12, 1963 annotated "Pill Box" (1949 RAF aerial photo No. 6023 81A/128; Hunting Surveys Ltd. aerial photo No. 7450, 2 February 1963; 2021 E117951C)	single, corner aperture with widened viewing arc
5	Jardine's Lookout (Figure 19 to 22)	11-SE-16B, 7 October 2014 (Hunting Surveys Ltd. aerial photo No. 8055, 6 February 1963)	Probable single, corner aperture with widened viewing arc
6	Middle Gap (Figure 23-32)	213-NE-15, December 1973 (1949 RAF aerial photo No. 6080 81A/127; Hunting Surveys Ltd. aerial photo No. 7002, 1 February 1963)	single, corner aperture with widened viewing arc
7	Wanchai Gap (Black's Link) (Figure 33-34)	(Hunting Surveys Ltd. aerial photo No. 7271, 1 February 1963)	Collapsed after 1963: single, corner aperture with widened viewing arc
8	Victoria Peak (Figure 35 to 39)	195-SE-16, March 1974 (1949 RAF aerial photo No. 6080 81A 127; Hunting Surveys Ltd. aerial photo No. 7961, 6 February 1963)	two apertures
9	High West (Harlech Road) (Figure 40 to 43)	212-NE-2, January 1975 (Hunting Surveys Ltd. aerial photo No. 7980, 6 February 1963)	two apertures

10	Matilda (Mount Kellet) (Figure 44 to 53)	213-SW-5, November 1973 annotated as "Pill Box" (RAF aerial photo No. 6104 81/A128 8 May 1949; Hunting Surveys Ltd. aerial photo No. 6832, 6 February 1963)	two apertures
11	Middle Spur (Figure 54 to 58)	Not yet identified to be marked on any map; or exposed to aerial photography due to plant cover	two apertures

The map below (**Figure 1**) locates the eleven OPs. **Appendix 1** presents the photos of each of them. **Appendix 2** describes how to visit the OPs at Braemar Hill, Middle Gap and Middle Spur.

1:80000 Hong Kong and the New Territories map published by War Office 2nd edition 1945

Figure 1: Location of surviving WWII fixed observation posts on Hong Kong Island – note six have broadly northerly axes, four southerly axes and one a westerly axis. Numbers are those indicated in **Table 2**. (Map base: 1:80000 Hong Kong and the New Territories map published by War Office 2nd edition 1945)

The roofs of Nos. 1, 5 and 9 have been or are being used as viewing platforms by the Agricultural, Fisheries and Conservation Department (AFCD), which has provided some information about No. 9. No. 7 collapsed, it would appear after probably explosive demolition sometime after 1963. There are clear signs that reinforcement bars were scavenged by removal of interior concrete surfaces, so possibly the structure had become unsafe. However, by inference from Major Monro's diary entry for 26th December, it is also possible that the OP may have suffered battle damage,

> "After considerable search I found West Group H.Q. in a culvert under Lugard Road. Crowe had been shelled out of 3 houses where he had established his H.Q. he hoped this hideout would last longer."[16]

No. 4 on Braemar Hill, which shows signs of having been used by the Japanese occupation forces, who dug a tunnel from the inside of it to an exit near and below it, has been reported in the media.[17] At No. 10, Matilda OP, the rear wall had a large opening put in it by the Japanese that leads into an extensive, branching tunnel in the hillside immediately behind. The tunnel exits on the same level some distance away on the hillside to the north east. In both cases the adaptation seems to have been designed to provide either a better shelter against counter-battery fire, a more bomb-proof air raid position, or a covered secondary exit. If the latter, it may suggest that during the Battle of Hong Kong, at least some OPs may have been attacked and their crews killed or captured because they had no alternative means of getting out. These tunnels are similar in headroom, width and appearance to those found near British defence structures in Jardine's Lookout and Devil's Peak and, unrelated to any nearby previous British structures, on Lamma Island.

Just as this note is not an exhaustive list, nor is it an account of the role or performance of these OPs in the defence of Hong Kong, for which in any case the surviving records would not be adequate.

This list is an update of the photographic information in **Lai**, **Davies** & **Tan** (**2011**) and adds three extra OPs that have now been visited (Braemar Hill, Middle Gap and Middle Spur). The recently explored structure above Shaukeiwan may possibly the Shaukeiwan OP mentioned in the Fortress Message Log, but we treat this in a separate note (this issue, pp. 120–127) since we have significant doubts. What we had hoped might be the Kennedy Road Special OP, we are now inclined to treat as a mainly Japanese defensive structure. We are also treating it in a separate notein this issue (pp. 128–137).

This note includes a series of site photos for identification on the ground, for

16 Major John P. Crowe, R.A. was nominally the CO of No.2 Mountain Battery HKSRA.
17 See **Wong** (**2021**).

an appreciation of their locations, and to give a general idea of the current condition of the remaining structures. These are preliminary details much needed by conservation planners and surveyors, who can complete the list with detailed survey data.

HONG KONG OP TYPOLOGY

Of the eleven standard OPs, remains of which have been identified and visited, it is clear that they can be broken down into two groups. The first group comprises five OPs that we shall designate as Type 1. These have a single, angled observation slit on the front centreline. The second group of six OPs comprises what we designate as Type 2. These have two separate, angled observation slits located on the side corners of a structure that is otherwise similar in ground plan to Type 1s.

In addition to the clear morphological difference illustrated in **Figures 2** and **3**, the groupings are also geographically distinct, which is perhaps an indicator of the different roles to which we shall turn shortly. Type 1 OPs are all on the northern side of Hong Kong Island.

What springs out from this typology, and is vividly illustrated by **Figure 4**, is the very obvious point that the two different types are not more or less randomly spread around Hong Kong Island. Rather, all the Type 1 OPs are on the north or north east side of the island and cover observation arcs from, very roughly, northwest around to east south east. With the exception of Victoria Peak OP, to which we shall return, all the Type 2 OPs, by contrast are to be found on the south or west of Hong Kong Island.

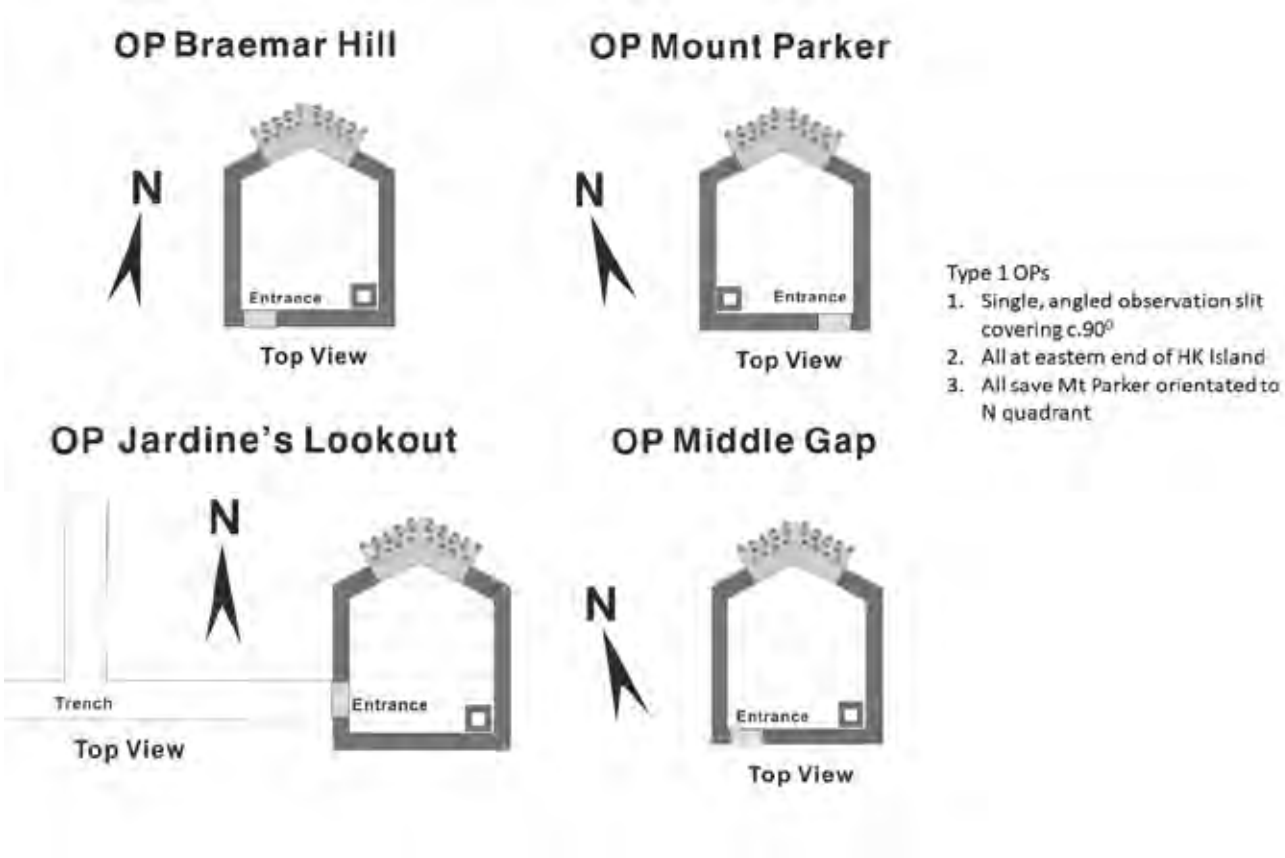

Figure 2: Type 1, single observation slit OPs (not to scale)

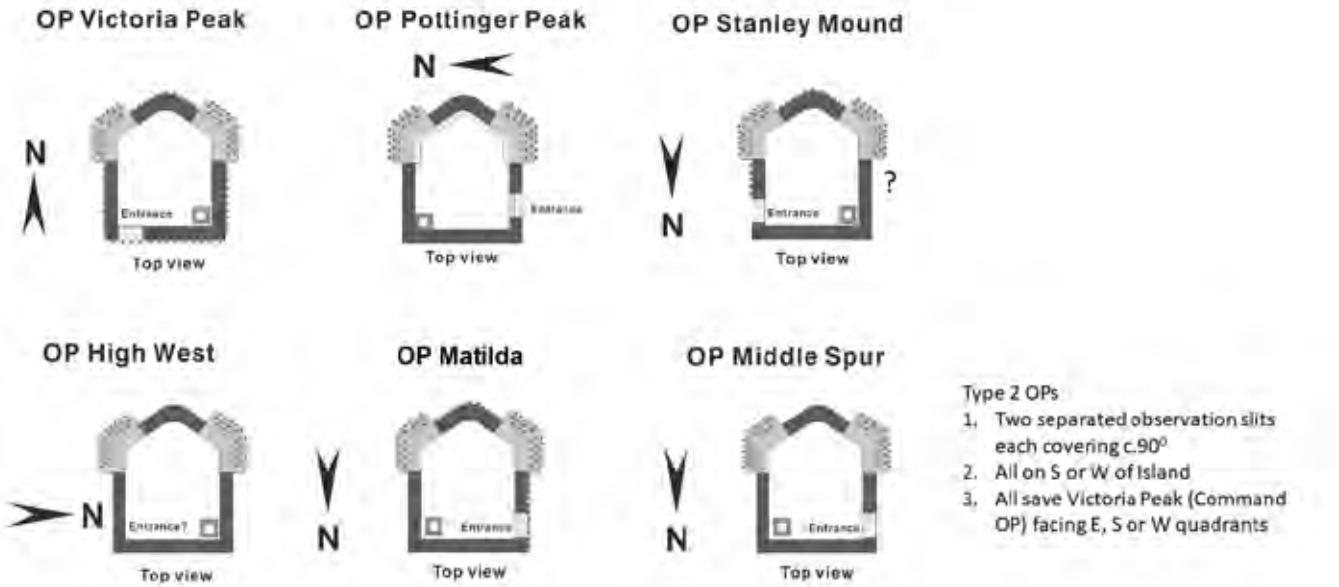

Figure 3: Type 2, double observation slit OPs (not to scale)

Surveying and Built Environment Vol 31(1), 45-104 May 2022 ISSN 1816-9554

Figure 4: Geographical location of OPs by typology

The exceptions here are two. There are the anomalies of Kennedy Road and Shaukeiwan, which until more is learned of them, we can at present ignore. And there is the OP at Victoria Peak, which is a Type 2 OP on the north side observing the whole northern sector. This poses the more general puzzle of explaining the observed pattern.

Arguably the most likely explanation for the two types of OPs may lie in the history of Hong Kong's pre-war defence planning. As outlined by **Kwong & Tsoi (2014: Ch.5)**, this lengthy process came in spasms with a burst of energy in the 1920s that tended to ignore the mainland, and then a renewed focus in the mid- to late 1930s, when attention was focused on the need for defences against an incursion from the north.[18] It is thus possible that the Type 2 OPs were the first to be planned, designed and built, with building probably occurring in the mid-1930s. This would explain Victoria Peak as a sort of backstop, keeping an eye on the seemingly less important north, whilst the focus of attention was on the problematic sea approaches and potential landing beaches.

On this analysis, it would only have been with the renewed focus of the late 1930s, with its awareness of the danger of a land-based invasion from the north, that what became the Type 1 OPs would have become a priority. We can infer two things from any such new line of thinking. One might be that given the urgencies of the late 1930s, it was decided not to build any more Type 2 OPs, but to 'slim down' the basic design to the smaller, quicker to build Type 1 format. The other would be that Victoria Peak with its existing Type 2 OP may have acquired the role of Command OP that we see in the sources.

On this line of thought**, Table 1** suggests the obvious rationale for the observed pattern in **Figure 4**, shown in **Table 3** below and derived from the few sources we have. In general, the function of any OP is given by its designation: observation. However, in the sources indicated in **Table 1**, there is one specific artillery function that is mentioned in relation to some, though not all OPs, which is flash spotting: a key to effective counter-battery fire of the kind that would be needed in the event of an enemy invading from the north.[19] As **Figure 4** and **Table 3** show, this seems to relate very clearly to our OP typology.

18 It is interesting that a very similar pattern can be seen in the case of Singapore's defences – see **Air Historical Branch of the Air Ministry (nd)**, **Ong (2003)** and **Farrell (2015)**.

19 A simplified explanation is that OPs dealing with bombardment from the sea can be assumed to be able to see and locate the enemy guns. By contrast, enemy artillery firing from hard to see locations are all but invisible and some means are needed, such as flash spotting, to identify roughly where they are.

Table 3: High Level and Low Level OPs by type, whether used for flash spotting and orientation

Type	OP name (LL/UL)	Known function	Orientation
EAST GROUP			
2	Pottinger Peak (UL)	FS	SE
?	Shaukeiwan (UL)		E
1	Mount Parker (UL)	FS	NE
1	Braemar (UL)	FS	NNE
1	Jardine (UL)	FS	N
2	Stanley Mound (UL)		SSE
WEST GROUP			
1	Mount Nicholson (UL)	FS	NNE
1	Wanchai Gap (UL)	FS	N
2	Middle Spur (UL)		SSW
?	Kennedy Road (LL)		?
2	Matilda (UL)		S
?	Mount Austin (UL)	FS	
2	Victoria Peak (UL)	Command OP	N
2	High West (UL)		WSW
?	PB69 (LL)	FS	?

It seems safe to conclude that Type 1 OPs were those used mainly for flash spotting. With the exception of Pottinger Peak (sections shown in **Figure 5**), Type 2 OPs (**Figure 6**) were not so used.

This explains two things. First, it explains the concentration of the upper level flash spotting OPs in the eastern sector and the eastern part of the western sector, since the most militarily threatening land mass was opposite the centre to east of Hong Kong Island. Second, it explains the co-opting of the Type 2 Pottinger Peak, since part of its arcs of observation covered the extreme 'round the corner', Clearwater Bay Peninsula domain of threat to be covered by the main flash spotting OPs. Accordingly, Pottinger Peak OP's left observation slit would have been given a flash spotting role as part of the other three East Group flash spotting OPs. At the same time the OP as a whole retained the same 'sea approaches' observation role that it shared with all the other Type 2 OPs. If those are fair conclusions, we can also conclude that, should we be able to discover more about the unidentified Mount Austin OP, for which we have no detail bar its location, it is likely it will prove to be a Type 1 OP. PB69, given that it was also a pillbox, was clearly outside this typology and, as noted, was probably a design kin to PB59 in the naval dockyard.

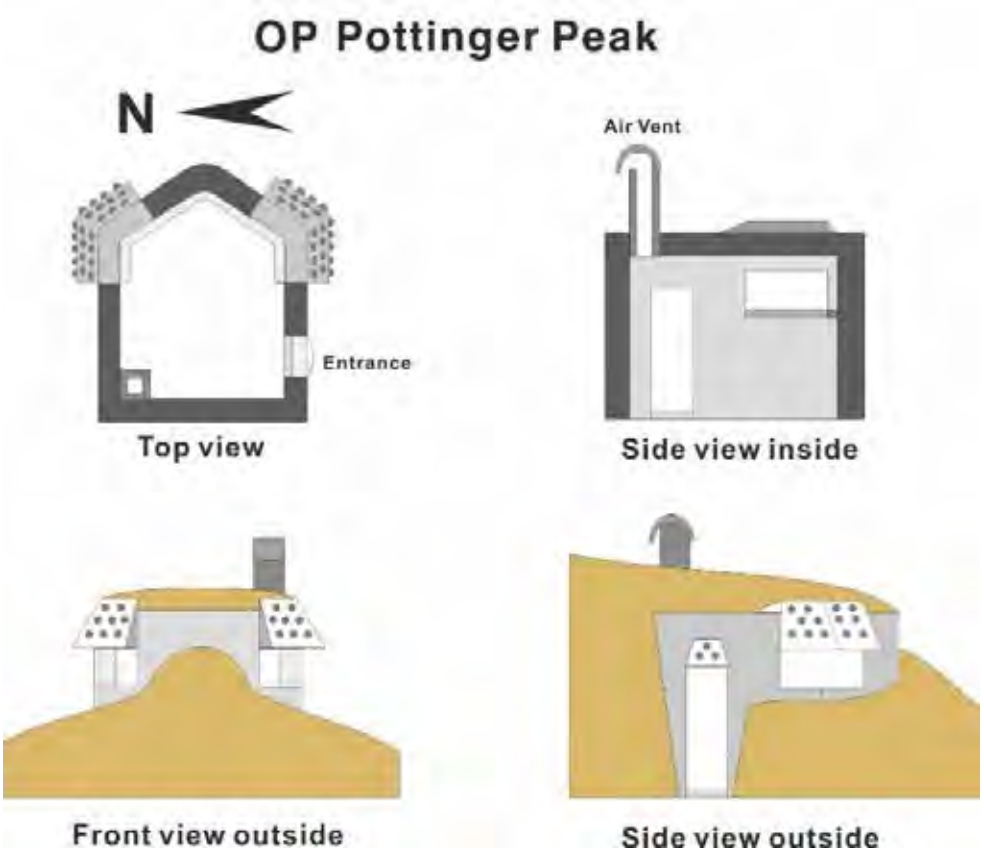

Figure 5: Sections of Type 2 OP Pottinger Peak (not to scale)

Surveying and Built Environment Vol 31(1), 45-104 May 2022 ISSN 1816-9554

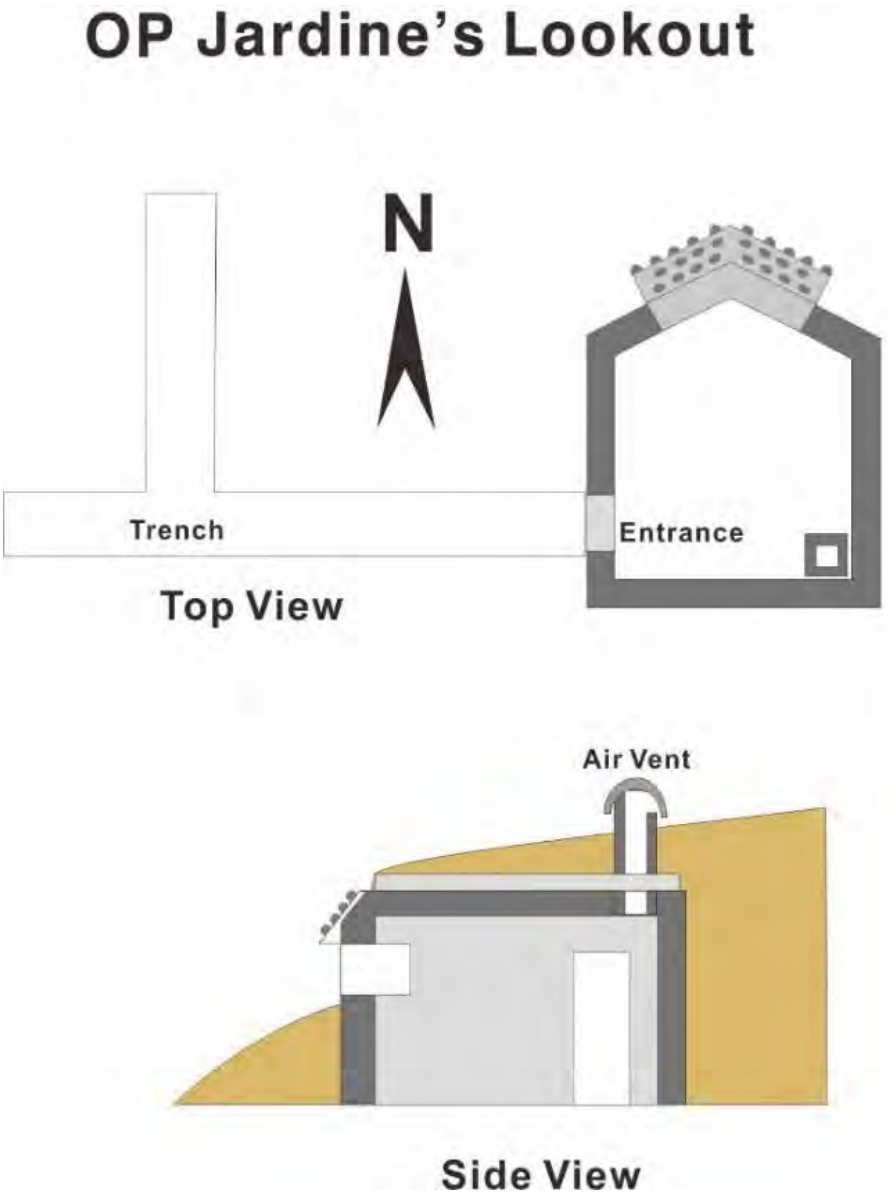

Figure 6: Sections of Type 1 OP Jardine's Lookout (not to scale)

It is noteworthy that there are four flash spotting OPs in each of the Island artillery groupings, the easternmost in each group being around five kilometres from the westernmost. An interesting difference here is between East Group, for which there were four upper level, flash spotting OPs (one Type 2 and three Type 1s), and West Group (two Type 1 and two unknown), for which the westernmost flash spotting was by a low level OP. One possible conclusion to draw here is that we have not sufficient data to identify all the flash spotting OPs and that, at least potentially, there may have been four upper level and four low level flash spotting OPs in each Group.

That problem notwithstanding, what we can at least loosely infer from the scant data we do have, which is presented in **Table 4**, is that the distance between the flash spotting OPs generally, though not in all cases, the gap between the Middle Gap and Wanchai Gap OPs being the exception, conformed to the recommended standard spacing between flash spotting OPs of "from about 2000 to 8000 yards (1828-7315m)".[20] One must note, however, that there was provision for what was called a "short base", which was a single flash spotting post with a subsidiary position a few hundred yards away for the predictions of which a lower level of accuracy was accepted.[21]

Table 4: Approximate distances between known flash spotting OPs

Names	Distances
EAST GROUP	
Pottinger Peak to Mount Parker	3.03km
Mount Parker to Jardine's Lookout	2.8km
Mount Parker to Braemar Hill	2.3km
Jardine's Lookout to Braemar Hill	2.01km
CROSSOVER	
Jardine's Lookout to Middle Gap	2.0 km
WEST GROUP	
Middle Gap to Wanchai Gap	1.2 km
Wanchai Gap to Mount Austin	(2.7km?)
Mount Austin to PB69	(2.4km?)

20 https://nigelef.tripod.com/p_artyintcb3945.htm#Flash_Spotting.

21 During WW2 counter-battery location of enemy guns was graded to seven levels of accuracy: J - 10 yards; W - 25 yards; Z - 50 yards; A – 100 yards; B – 200 yards; C – 300 yards; D – 400 yards. Single post accuracy was accepted as never better than B, see https://nigelef.tripod.com/tgtacqcb.htm#standard%20accuracies

We know that the baseline for, and the number of flash spotting OPs were critical factors in the accuracy of the computed location of the source of the artillery 'flash'[22], and that to that end the OPs worked in groups of, ideally, four but at a minimum three. This deftly explains the layout in **Table 4**, although looking at the maps in Figures 1 and 4, it would seem that the shape of Hong Kong Island must have made it almost impossible, taking separation to be given primarily in east/west distances, to have four adequately separated flash spotting OPs in each sector, and that in practice the OPs are most likely to have worked in groups of three, and often in pairs.

COMPARING FIXED OBSERVATION POSTS WITH PILLBOXES

Hong Kong OPs and PBs share a certain similarity of ground plan and so may occasionally be confused with each other. This is not surprising since, as Oldham shows, clarity as to nomenclature was slow to develop and all the various kinds of strengthened concrete defensive structures, especially frontline ones like OPs and PBs, emerged from a single set of design ideas.[23] That said, by the commencement of hostilities in Hong Kong in 1941, the two kinds of structure had come to differ in important ways in terms of location and operational use, external appearance and internal layout.

Location and operational use

In Hong Kong PBs were located for specific defensive purposes, their firing loopholes covering arcs of fire intended to interdict enemy movement through or across a tactically important location. OPs are in locations, often well up the spine of spurs giving the optimum unimpeded view of the terrain to the front, over the intended arc of observation out to as great a distance as the terrain being surveyed allows, to provide as much intelligence on enemy movements and, especially, enemy artillery activity as possible. OPs' positioning is almost always below crestlines so that they are covered by higher ground on one or both sides. By contrast, PBs can be as low as close to the high water mark (HWM) and as high as necessary to command any gap through hills or other probable enemy line of approach (see for more on this below).

External appearance

Externally there are four visible differences in basic *appearance*. First and simplest, in general OPs are smaller

22 Flash spotting was generally used at night, when the muzzle flash of a gun firing could be observed, its bearing taken and, triangulated with the bearing from other flash spotting OPs, the position of the gun that had fired computed.

23 **Oldham, 2014**, Ch.1 points out that the first British examples dated from 1915 and were variously referred to as blockhouses, emplacements, nests, dugouts or shell-proof shelters. Anent the etymology of "pill box/pillbox", which is first identified in print in 1917, he notes that the evidence unequivocally shows its derivation from "pillar box" (the English post box or mail box) because of its slotted opening.

than PBs, most particularly in having a notably smaller ground footprint. This is partly a function of their specific and limited task, but also because, given their elevated and potentially conspicuous positioning, it would have helped in disguising them, in addition to efforts at camouflage, by making it easier to blend them into the hill mass.

Second, all the standard OPs have a heavy, overhanging roof above the main observation aperture or apertures, camouflaged as noted below, sloping rearwards to the top of the roof. The probable purposes of the overhang were multifold. To ensure against sunlight or moonlight reflecting off the lenses of the observers' instruments. To shield the observers from the heat and glare of the sun. And possibly to protect the observers against aerial attack.

A distinct diagnostic, not found on PBs, though occasionally on shelters and coastal defence battery structures (Aberdeen Reservoir Road, Mt Davis Battery), is a unique camouflage method using a scatter of cement patches like 'cookies'. These are most commonly on the surface of the heavy frontal sloping overhead cover. However they are also seen, on some two aperture OPs (Stanley Mound, & Matilda), on the large, vertical surfaces between the apertures, and in a few (Stanley Mound, Victoria Peak and Matilda) on side walls. It is possible this was because the nature of the terrain obviated burying the walls in earth.

A possible purpose of the 'cookies' may have been to avoid sun light glare on the otherwise large, bare concrete surfaces. As likely will have been an attempt to break up the visual appearance of an otherwise unnaturally large and regular surface. The sloping overhead cover or bare walls with their 'cookies', again given the positioning, may thus have been intended to create the illusion of the sort of large rock outcrop common on Hong Kong Island's hilly, granitic slopes. As can be seen with still extant hooks along the lower lip of the overhead cover at Middle Gap and Middle Spur, and traces of the same on many other OPs, this rock outcrop illusion was probably reinforced by the stretch of a camouflage net from the lip to the slope in front of and below the OP. **Oldham (2014, 105)** notes a similar feature on one of the WW1 PBs he describes, so it would also have been standard practice in 1941. In addition, the three-colour camouflage paint scheme normally used for shelters could still be found on the frontal heavy sloping overhead cover of the Stanley Mound OP some years ago (**Lai, Davies** & **Tan 2011**: **Photo 16**, **221**).

A third clear difference is in the openings themselves. For the PBs there was the standard 'V'- shaped external form of each opening, wide on the external wall surface narrowing to the firing opening with the machine gun mount on the interior, consonant with the traversing of a machine gun along its firing arc. With the OPs, any opening, even when around an angle, is rectilinear maintaining its full width and height throughout like

a domestic window. However, the height:width ratio is such as to make the opening appear relatively narrow, top to bottom, and thus slit-like, so less visible and also less vulnerable to incoming fire. As with PBs, OP openings were shut by hinged steel shutters, bolted from the inside. Where pillbox shutters opened outwards like windows, OP shutters were, like those in beach defence and coastal artillery searchlight shelters, hinged at the bases to drop outwards like flaps. The openings, as we shall see below, suggest a simple diagnostic that may be related to possible differences in roles.

Finally, the roofs of the OPs differ from those of PBs. First, none of them has any commander's cupola although, as with the PBs, they all have a ventilation shaft. With PBs we know these latter to be flat-topped. The Middle Gap and Middle Spur OPs have fairly well preserved shafts, though their cappings or tops are partly missing, and these, when allied with the more complete top of the Middle Gap OP ventilation shaft, suggest a careful design feature. The Middle Gap and Middle Spur shafts have a curious half round, semi-ducted form made, it appears, of a half section of heavy duty, large bore cement pipe. At Middle Gap this is 'camouflaged', or so it may be, by the application of a lightly reinforced, partly rounded off concrete upper surface. The outlet is a small rectangular outlet at the back of the pipe. The conformity of the remains of the tops of all intact shafts suggests that a kind of semi-ducted, aerodynamic design, would seem to have been standard. From the sites visited, the ventilation shaft is always found located at near back corner furthest from the entrance.

Additional support for such a conclusion requires reverting to the interior contrast between PBs and OPs. The interior of the PBs had a system of branching ventilation ducts reaching out from the main ventilation shaft to inlets above each firing loophole. By contrast, the smaller OPs have no branches, only the opening in the ceiling in one of the rear corners of the OP, which is also on the side on which the folding pipe cot bunks were placed (see *Internal Layout* below). Effective ventilation of the whole PB would thus depend on generating an efficient through draft, and the design of the ventilation shaft cap seems possibly to have been intended to achieve that effect.

Finally, the outlet design, with its small, semi-covered opening turning through a right angle close to the top also suggests a design intent to frustrate attempts to use the ventilation shaft to drop hand grenades into the interior. Measurements have yet to be made to confirm that, given the time delay of the Type 97 grenade fuse (4-5 seconds) and the grenade's dimensions (95.25mm x 50mm), the ventilation shaft outlet would have achieved that purpose.

Apart from the protrusions of either commander cupola or ventilation shaft, a signal difference between PB and some OP roofs is that the former is otherwise flat, ending at the front edge in a simple

downward bevel. By contrast the tops of the one, or two sloping overhead covers above the openings, on all the OPs except Middle Spur, stand proud of the roofline by around twenty-five to thirty centimetres. We have no data that explains this design feature. However, it has some resemblance to the alternate machine gun positions in some Hong Kong Island beach PBs, suggesting that the roof may have been intended to serve as some sort of alternate defensive position should an OP come under attack.

Otherwise, the single entrances have similar steel doorways in both PBs and OPs. However, where PB entrance ways are usually jinked to prevent a clear line of fire for any incoming enemy, the OP entrances lead straight into the main chamber. No Hong Kong OP appears to have any tunnel approach of the kind seen in many PBs, although the Jardine's Lookout OP has an approach trench.

Internal layout

Internally a PB is designed for the effective employment of its crew in their primary defensive task and for their needs for food and sleep. An OP, whilst it must meet the same basic crew support needs, is otherwise internally organized to ensure uninterrupted observation day and night and the effective communication of the intelligence so gleaned to their command HQ. Equally, floor space in the interior of an OP is needed for basic data recording and a way of screening the apertures during night time from the light needed for data recording in the OP interior. In Middle Gap a single hook in roughly the centre of the ceiling has an unexplained purpose, but possibly for lighting. Traces of something similar, though differently positioned, can be seen at Matilda.

For its defensive purposes a PB has up to two firing loopholes on its forward face or faces, sometimes with one or two more loopholes along one of its sides and, in some unusual examples, in the rear face. How many loopholes and their dispositions are governed by the defensive arcs to be covered. All loopholes were fitted with machine gun mounts. An OP's apertures were not designed for the deployment of weaponry, but to provide a clear opening for the use of observing instruments like telescopes, range finders, flash spotting instruments, etc. It follows that they are much wider, usually two to three times as wide and have straight sides, and a full width interior opening. In place of the PBs' machine gun mounts, most OPs (Kennedy Road is an exception) have a shallow shelf on which to rest observers' elbows, leaving space for any instrument mounting as, for example, with a flash spotting telescope, the narrow, 15^0 field of view of which needed the steadying of a tripod[24].

Where PBs have a water tank inside them for drinking or cooling machine guns, no such provision has been found in any OP. This possibly suggests more frequent changes of the OP crews, each of whom will have brought sufficient

24 For details of the contemporary Instrument, Flash Spotting, No.4, Mk.1 see https://nigelef.tripod.com/tgtacqcb.htm, also **Mitchell** (**2012**: **Ch.2**).

water for his turn of duty. Middle Spur, on which we comment further below, seems in this respect something of an exception.

No OP has survived in sufficiently intact a form for us to be able to comment more fully on interior fit-out. What may be wall-mountings for up to two pipe cots can be seen at Mount Parker and Matilda. In Middle Gap, evidence for mountings for two, fold-up pipecots can also be seen, including the mounting brackets for the upper cot and one surviving tricing chain. The cots would argue a standard OP team of four, two on watch, two off, though in the Type 2 OPs (see below) it seems likely the team would have been larger, and this seems supported by Middle Spur's additional splinter-proof shelter (see below). It was noted above that the wall with the bunks was usually on the side of the OP in the rear corner of which the ventilation shaft was placed. This latter feature will have helped ensure a cooling draught for the off watch occupants of the bunks. In Middle Spur, the cot fittings are on the back, not the side wall.

No obvious signs have survived of the telephone communications systems we know existed, with one possible exception. This is at Matilda, where to the left of the OP there is a low concrete box with an opening in the back, which from remaining traces had a metal door and fittings. This may have been related to the communications system and further work is needed to try to decipher the structure's purpose. No similar structure has so far been identified at any other OP site.

ACCESS, ANCILLARY BUILT FEATURES AND ARCS OF OBSERVATION

These are aspects of the OPs still to be fully researched. Following recent work on Middle Spur, it is clear that additional work on the other OPs may help identify hitherto unrecorded features and, perhaps, help further refine the typology, as well as possible construction sequence and function.

First, Middle Spur appears to be the only OP that does not have the possible alternative defensive position upstands on its roof. Rather, the evidence suggests that, apart from over the heavy, sloping overhead covers over the embrasures and the entrance way, Middle Spur was almost entirely covered with earth. As with some of the other OPs, however, there is a nearby entrenchment, which may have been the alternative defensive position.

Second, at present Middle Spur is the sole OP to have surviving features that have not so far been observed with the other OPs. First, there is a nearby splinter-proof shelter, equipped with fold-down cot fittings for four personnel. This reveals a perceived need for continuous manning that the relatively remote location of this OP may otherwise have

made difficult, thus perhaps requiring two teams of observers on site.

Third, there is a still intact, c.300m long, stepped concrete pathway leading down towards Repulse Bay Road. The original point at which this met the driveway to a large house on the north side of Repulse Bay Road has been destroyed by development.[25] This is probably explained by a pre-existing small service reservoir, constructed before 1934, for which the path would seem originally to have been constructed.[26] This would have been an alternative access/egress route since the more probable access would have been from the southeast, where aerial photograph analysis places a cluster of other WW2 period buildings that may have been a company HQ.

Finally, Middle Spur is the only OP not to have a clear view to its front. It is placed at c.150m above mean sea level, on the north side of a saddle with its axis pointing southwest. In this position it has a 160m summit immediately to its front completely obscuring an arc either side of southwest. The two observation embrasures have axes on south-southwest (c.160^0) and just west-northwest (c.280^0) Its function would thus solely to have been to observe the actual near approaches and beaches of Deepwater Bay to the west and of Repulse Bay to the southeast (**Figure 7**). This possibly confirms our hypothesis that the Type 2 OPs were planned and built when Hong Kong defence planning was focused on defending the territory against invasion by sea.

25 Today Ming Wai Garden (明慧園), 45 Repulse Bay Rd.

26 British National Collection of Aerial Photography, href="http://ncap.org.uk/NCAP-000-000-348-466">Tsin Shui Wan; Hong Kong; Hong Kong S.A.R..

Figure 7: The arcs of observation of the Middle Spur OP

CONCLUSION

Clearly, there is a great deal more to do to identify any further OPs, to eliminate from the list in **Table 1** any that were intended to be built but were not, or were not part of the permanent OPs, and any duplication caused by the confusion of names.

ACKNOWLEDGEMENTS

The authors are grateful to Dr. Tony Banham for the supply of the Fortress Message Log and a copy of Major Monro's diary; Mr. Rob Weir for advising on the locations of and routes to the OPs of Mount Parker, Middle Gap, Wanchai Gap, Sr. Victoria Peak and Middle Spur; and Sr. Dr. Jason Wai Ying Kwong for assistance for touching up Figures 2, 3, 5 & 6.

REFERENCES

Primary Sources

Account of the Battle of Hong Kong 1941, Internment and Escape to Chongqing 1942, by Major JH Monro MC RA, unpublished, edited transcript (courtesy of Dr. Tony Banham)**.**

Fortress Message Log, unpublished transcript of a now lost manuscript document covering the period 15th December 1941 to 25th December 1941, (courtesy of Dr. Tony Banham).

Maltby C M "Operations in Hong Kong from 5th to 25th December, 1941", *Supplement to the London Gazette*, 27th January 1948, 699-726.

The National Archives (TNA), Kew, MUN 7/432, Papers on:- Machine-gun pill-box designed by Mr. E.W. Moir, Munitions Council member.

War Office (1937), Manual of Flash-Spotting, London, HMSO.

War Office (1941), *Flash-spotting Training*, Pamphlet No. 1, Air-burst ranging (for use by Survey Regiments R.A.), London: HMSO.

WO 106/2379, War Office: Directorate of Military Operations and Military Intelligence, and predecessors: Correspondence and Papers. WAR OF 1939-1945. HONG KONG. Interim defence scheme. The National Archives, UK.

Secondary Sources

Air Historical Branch of the Air Ministry, *The Campaigns in the Far East*, Volume 1, Far East Defence Policy and Preparations for War, RAF Narrative, first draft, pp.4-15, available at https://www.raf.mod.uk › units › air-historical-branch.

Farrell B (2015*), The Defence and Fall of Singapore*, Singapore: Monsoon Books

Kwong C M & Tsoi Y L (2014), *Eastern Fortress: A Military History of Hong Kong, 1840 -1970*, Hong Kong, Hong Kong University Press.

Lai L W C, Davies S N G & Tan Y K (2011), "Upland World War II Headquarters, Pillboxes, and Observation Posts on Hong Kong Island

in Photos," *Journal of the Hong Kong Branch of the Royal Asiatic Society*, 51, 207-236.

Lai L W C, Tan, Y K & Davies, S N G (2021), *British World War II Pillboxes on Hong Kong Island*, Hong Kong Institute of Surveyors, Hong Kong.

Lee H Y (2011), *Concrete for War: Heritage in Peace – the Heritage of War Architecture*, paper originally presented at the International Forum on Conservation and Adaptive Reuse of Reinforced Concrete Buildings, Hong Kong January 2011, and accessed at http://www.centraloasis.org.hk.

Mitchell A J (2012), *Technology for Artillery Location, 1914 – 1970*, Glasgow: self-published.

Muir A (1969), *First of Foot: the History of the Royal Scots*, London, William Blackwood.

Oldham P (2014), *Armageddon's Walls: British Pill Boxes 1914-1918*, Burnley: Pen and Sword.

Ong C C (2003), *Operation Matador: World War II: Britain's Attempt to Foil the Japanese Invasion of Malaya and Singapore*, Singapore: Eastern Universities Press.

Parham H J & Belfield E M G (1956), *Unarmed into Battle; the Story of the Air Observation Post*, Winchester: Warren & Son.

Parks and Wildlife Commission of the Northern Territory (2016), *Casuarina Coastal Reserve Management Plan April 2016*, www.parksandwildlife.nt.gov.au

Wong S (2021), "Race to Save Hong Kong's War Relics," *Nikkei Asia*, 18 September 2021. https://asia.nikkei.com/Life-Arts/Life/Race-to-save-Hong-Kong-s-wartime-relics.

APPENDIX 1: Photos of 11 OP covered by this note

No.	Name (Figure no. in Appendix 1)	Classifier
1	Stanley Mound (Figure 1 to 4)	two apertures
2	Pottinger Peak (Figure 5 to 8)	two apertures
3	Mount Parker (Figure 9 to 12)	single, corner aperture with widened viewing arc
4	Braemar Hill (Figure 13 to 18)	single, corner aperture with widened viewing arc
5	Jardine's Lookout (Figure 19 to 22)	Probable single, corner aperture with widened viewing arc
6	Middle Gap (Figure 23-32)	single, corner aperture with widened viewing arc

7	Wanchai Gap (Black's Link) (Figure 33-34)	Collapsed after 1963: single, corner aperture with widened viewing arc
8	Victoria Peak (Figure 35 to 39)	two apertures
9	High West (Harlech Road) (Figure 40 to 43)	two apertures
10	Matilda (Figure 44 to 53)	two apertures
11	Middle Spur (Figure 54 to 58)	two apertures

Stanley Mound (two apertures): Figure 1 to 4

Figure 1: Exterior front view of OP Stanley Mound

Figure 2: View from rooftop of OP Stanley Mound

Figure 3: Left side view of OP Stanley Mound showing the entrance and left aperture blocked by concrete

Figure 4: Right side view of OP Stanley Mound

Pottinger Peak (two apertures): Figure 5 to 8

Figure 5: Exterior front view of OP Pottinger Peak

Figure 6: Top view of Pottinger OP Peak

Figure 7: Side view of OP Pottinger Peak showing the entrance

Figure 8: Interior view of OP Pottinger Peak

Mount Parker: Figure 9 to 12

Figure 9: Exterior front view of OP Mount Parker

Figure 10: View from rooftop of OP Mount Parker

Figure 11: Pottinger Battery (left gun emplacement in the middle) seen from top of OP Mount Parker

Figure 12: Interior view seen from the aperture of OP Mount Parker

Braemar Hill: Figure 13 to 18

Figure 13: Exterior front view of OP Braemar Hill

Figure 14: Exterior side view of OP Braemar Hill

Figure 15: Rear view of OP Braemar Hill

Jardine's Lookout: Figure 19 to 22

Middle Gap (single aperture, but on a corner facing two directions): Figure 23 to 32

Wanchai Gap (below Black's Link between Middle & Wanchai Gap): Figure 33 to 34

Victoria Peak (end of Austin Hill Road) (two apertures): Figure 35 to 39

Figure 36: Exterior left front view of OP Victoria Peak
Figure 37: Exterior right front view of OP Victoria Peak
Figure 38: Exterior right side view of OP Victoria Peak
Figure 39: Exterior rear view of OP Victoria Peak

High West (end of Harlech Road) (two apertures): Figure 40 to 43

Figure 40: Exterior front view of OP High West
Figure 41: Exterior right front view of OP High West
Figure 42: Exterior left front view of OP High West
Figure 43: View from the front of OP High West

Matilda (Mount Kellet) (two apertures): Figure 44 to 53

Figure 44: Exterior front view of OP Matilda
Figure 45: View from the rooftop of OP Matilda
Figure 46: Front top view of OP Matilda
Figure 47: Rear roof of OP Matilda with its damaged ventilation shaft & portal of an earth tunnel behind
Figure 48: Left side view of OP Matilda
Figure 49: Right side view of OP Matilda
Figure 50: Interior view of OP Matilda showing the entrance
Figure 51: An earth tunnel portal behind the punctured rear wall of OP Matilda
Figure 52: Inside the earth tunnel behind OP Matilda
Figure 53: A trench a few steps up behind the OP Matilda below Matilda Hospital

Middle Spur (two apertures): Figure 54 to 58

Figure 54: Exterior front view of OP Middle Spur
Figure 55: Exterior side view showing the entrance of OP Middle Spur
Figure 56: Top view of OP Middle Spur showing a good example of an OP ventilation shaft design
Figure 57: Metallic hooks, like those on the OP Middle Gap, on one of the apertures of OP Middle Spur
Figure 58: Interior view of OP Middle Spur

Stanley Mound

Figure 1: Exterior front view of OP Stanley Mound
(17 February 2021 by Lawrence W.C. Lai)

Figure 2: View from rooftop of OP Stanley Mound
(17 February 2021 by Lawrence W.C. Lai)

Figure 3: Left side view of OP Stanley Mound showing the entrance and left aperture blocked by concrete
(17 February 2021 by Lawrence W.C. Lai)

Figure 4: Right side view of OP Stanley Mound
(17 February 2021 by Lawrence W.C. Lai)

Pottinger Peak

Figure 5: Exterior front view of Pottinger Peak OP
(6 February 2021 by Lawrence W.C. Lai)

Figure 6: Top view of Pottinger Peak OP
(6 February 2021 by Lawrence W.C. Lai)

Figure 7: Side view of Pottinger Peak OP showing the entrance
(6 February 2021 by Lawrence W.C. Lai)

Figure 8: Interior view of Pottinger Peak OP
(6 February 2021 by Lawrence W.C. Lai)

Mount Parker

Figure 9: Exterior front view of OP Mount Parker
(1 December 2020 by Lawrence W.C. Lai)

Figure 10: View from rooftop of OP Mount Parker
(6 February 2020 by Lawrence W.C. Lai)

Figure 11: Pottinger Battery (left gun emplacement in the middle) seen from top of OP Mount Parker
(6 February 2020 by Lawrence W.C. Lai)

Figure 12: Interior view seen from the aperture of OP Mount Parker
(1 December 2020 by Lawrence W.C. Lai)

Braemar Hill

Figure 13: Exterior front view of OP Braemar Hill
(27 December 2021 by Lawrence W.C. Lai)

Figure 14: Exterior side view of OP Braemar Hill
(13 February 2021 by Lawrence W.C. Lai)

Figure 15: Rear view of OP Braemar Hill
(16 June 2021 by Lawrence W.C. Lai)

Figure 16: Rear view showing the entrance of OP Braemar Hill
(19 October 2020 by Lawrence W.C. Lai)

Figure 17: Interior view of OP Braemar Hill
(13 February 2021 by Lawrence W.C. Lai)

Figure 18: A tunnel portal within OP Braemar Hill
(27 December 2021 by Lawrence W.C. Lai)

Jardine's Lookout

Figure 19: View from roof top of OP Jardine's Lookout
(6 February 2020 by James Caswang)

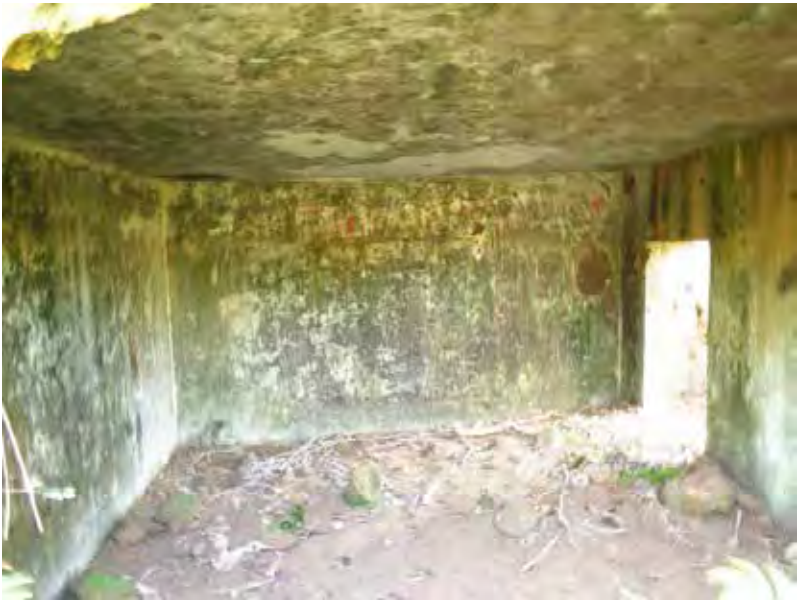

Figure 20: Interior view of OP Jardine's Lookout
(6 February 2020 by Lawrence W.C. Lai)

Figure 21: Entry trench of OP Jardine's Lookout
(13 February 2008 by Lawrence W.C. Lai)

Figure 22: Damaged aperture of OP Jardine's Lookout
(13 February 2008 by Lawrence W.C. Lai)

Middle Gap

Figure 23: Exterior front view of OP Middle Gap
(9 November 2021 by Lawrence W.C. Lai)

Figure 24: Front roof top of OP Middle Gap
(1 November 2021 by Lawrence W.C. Lai)

Figure 25: Exterior right side view of OP Middle Gap showing a more or less intact ventilation shaft
(9 November 2021 by Lawrence W.C. Lai)

Figure 26: Exterior left side view of OP Middle Gap showing remains of squatter improvisations
(1 November 2021 by Lawrence W.C. Lai)

Figure 27: Exterior rear view of OP Middle Gap showing the entrance, with its steel door wide open, and ventilation shaft
(1 November 2021 by Lawrence W.C. Lai)

Figure 28: Exterior rear side view of OP Middle Gap showing the entrance, with its steel door wide open, ventilation shaft, and apex
(1 November 2021 by Lawrence W.C. Lai)

Figure 29: View from in front of OP Middle Gap
(9 November 2021 by Lawrence W.C. Lai)

Figure 30: Interior view of OP Middle Gap from entrance
(1 November 2021 by Lawrence W.C. Lai)

Figure 31: The locking mechanism of an aperture shutter of OP Middle Gap
(1 November 2021 by Lawrence W.C. Lai)

Figure 32: Details of the rear of the ventilation shaft of OP Middle Gap
(1 November 2021 by Lawrence W.C. Lai)

Wanchai Gap (Black's Link)

Figure 33: Exterior front view of OP Wanchai Gap
(3 February 2021 by Lawrence W.C. Lai)

Figure 34: Top view from rear of OP Wanchai Gap
(3 February 2021 by Lawrence W.C. Lai)

Victoria Peak

Figure 35: Exterior left side view of OP Victoria Peak
(29 November 2021 by Lawrence W.C. Lai)

Figure 36: Exterior left front view of OP Victoria Peak
(29 November 2021 by Lawrence W.C. Lai)

Figure 37: Exterior right front view of OP Victoria Peak
(29 November 2021 by Lawrence W.C. Lai)

Figure 38: Exterior right side view of OP Victoria Peak
(29 November 2021 by Stephen Y.H. Yip)

Figure 39: Ex terior rear view of OP Victoria Peak
(29 November 2021 by Vincent L.H. Chan)

High West (Harlech Road)

Figure 40: Exterior front view of OP High West
(31 December 2021 by Lawrence W.C. Lai)

Figure 41: Exterior right front view of OP High West
(31 December 2021 by Lawrence W.C. Lai)

Figure 42: Exterior left front view of OP High West
(31 December 2019 by Lawrence W.C. Lai)

Figure 43: View from the front of OP High West
(31 December 2019 by Lawrence W.C. Lai)

Matilda (Mt. Kellet)

Figure 44: Exterior front view of OP Matilda
(1 February 2021 by Lawrence W.C. Lai)

Figure 45: View from the rooftop of OP Matilda
(1 February 2021 by Lawrence W.C. Lai)

Figure 46: Front top view of OP Matilda
(1 February 2021 by Lawrence W.C. Lai)

Figure 47: Rear roof of OP Matilda with its damaged ventilation shaft & portal of an earth tunnel behind
(1 February 2021 by Lawrence W.C. Lai)

Figure 48: Left side view of OP Matilda
(1 February 2021 by Lawrence W.C. Lai)

Figure 49: Right side view of OP Matilda
(31 January 2022 by Lawrence W.C. Lai)

Figure 50: Interior view of OP Matilda showing the entrance
(1 February 2021 by Lawrence W.C. Lai)

Figure 51: An earth tunnel portal behind the punctured rear wall of OP Matilda
(31 January 2022 by Lawrence W.C. Lai)

Figure 52: Inside the earth tunnel behind OP Matilda
(31 January 2022 by Stephen Y. H. Yip)

Figure 53: A trench a few steps up behind the OP Matilda below
Matilda Hospital (1 February 2021 by Lawrence W.C. Lai)

Middle Spur

Figure 54: Exterior front view of OP Middle Spur
(17 February 2021 by Lawrence W.C. Lai)

Figure 55: Exterior side view showing the entrance of OP Middle Spur
(17 February 2021 by Lawrence W.C. Lai)

Figure 56: Top view of OP Middle Spur showing a good example of an OP ventilation shaft design
(17 February 2021 by Lawrence W.C. Lai)

Figure 57: Metallic hooks, like those on the OP Middle Gap, on one of the apertures of OP Middle Spur
(17 February 2021 by Lawrence W.C. Lai)

Figure 58: Interior view of OP Middle Spur
(17 February 2021 by Lawrence W.C. Lai)

APPENDIX 2: LOCATIONAL INFORMATION OF THREE NEWLY VISITED AND EVALUATED OPS

In what follows we shall report the locational information of three newly visited and evaluated OPs of which there is certainty as to their identities and visitable remains, but that were not previously reported in **Lai**, **Tan** & **Davies** (**2021**).[27]

Braemar Hill: go up (about 10 minutes) in a broadly westward direction towards the top of the 260m knoll from an AFCD "Morning Walker Garden" sitting out area at a saddle on a very popular crossover trail that cuts off the large loop of Sir Cecil's Ride that goes around the north side of Braemar Hill.

Middle Gap/Mount Nicholson: walk northwards from Black's Link near Middle Gap down some government-maintained steps to reach a service reservoir (in about 15 minutes). Then, via a steep and seriously eroded zig-zag path, climb up the spur to the east of the service reservoir near a trained stream. The OP faces the development on the site of the former Mount Nicholson Government Quarters.

Middle Spur: go down the spur with Deep Water Bay on one side and Repulse Bay on the other on Violet Hill Path, an old and popular track that branches off what begins as a water catchment for Wong Nei Chong Gap Service Reservoir, then becomes a contour path that leads to Repulse Bay Gap (Tsin Shui Wan Au) before in turn becoming a catchment that circles the eastern flank of Violet Hill to service the Tai Tam Byewash Reservoir. The OP is OFF the path on a short, loop to the right going downhill, that leads to an old service reservoir, of the same vintage of those in JLO and Middle Gap, at around 150m above sea level. The OP is a few steps uphill from the service reservoir, which can also be reached by ascending a CEDD maintenance path "RB45" (the flooring of several hanging sections of which was removed and this poses some danger to users) from near No 28 Repulse Bay Road.

REFERENCE

Lai L W C, Davies S N G & Tan Y K (2011), "Upland World War II Headquarters, Pillboxes, and Observation Posts on Hong Kong Island in Photos." *Journal of the Hong Kong Branch of the Royal Asiatic Society*, 51, 207-236.

27 A useful, interactive map with all known OPs located on it, save a possible Shaukeiwan OP and a Kennedy Road OP we treat in separate field notes, can be found online at https://gwulo.com/Artillery-Observation-Posts-in-Hong-Kong#13/22.2327/114.1798/Map_by_ESRI/100.

Surveying & Built Environment

Small Witnesses to Big Events: A Padlock Found in the Shing Mun Redoubt

Stephen N.G. Davies* & Lawrence W.C. Lai**

ABSTRACT

This short note reports a statement made by Mr. Yung Yip (Yip) at the University of Hong Kong about some small relics he unearthed in October 2006, in the course of his activities clearing the Shing Mun Redoubt of earth and vegetation. Amongst the relics was a heavily corroded, 4 lever padlock of a type known to have been used in the British Army. The following brief note offers commentary and photographic evidence regarding Yip's statement and the relationship of what he found, if any, to the capture of the Shing Mun Redoubt by Japanese forces on the night of 9th December 1941.

INTRODUCTION

The fall of the Shing Mun Redoubt (SMR), guarded by a small number of soldiers (just 42) of 2 Royal Scots and the Hong Kong-Singapore (Battalion) Royal Artillery (HKSRA), in mysterious circumstances on the night of 9 and early morning of 10 December 1941 in the Battle of Hong Kong, hastened the premeditated abandonment of the Gin Drinker's Line and evacuation of the mainland troops to Hong Kong Island.

Following a survey by Sr. Dr. Ken Ching for the Department of Real Estate & Construction of University of Hong Kong, the SMR was shown to have two unequal parts each having a system of connecting tunnels and fire trenches. (**Figure 1**) However, the two systems are not themselves connected by any common tunnel or trench.

* Honorary Professor, Department of Real Estate & Construction, University of Hong Kong. Email: stephen.davies79@gmail.com

** Professor, Department of Real Estate & Construction, University of Hong Kong. Email: wclai@hku.hk, proflawrencelai@gmail.com, F.H.K.I.S., F.R.I.C.S.

Figure 1: The horizontal layout of Shing Mun Redoubt as surveyed by Sr. Dr. Ken S.T. Ching for the University of Hong Kong 2009

The larger system has four pillboxes (PB400, 401 [a & b], 402 and 403). The smaller and upper system has an artillery observation post (OP) (occasionally, if misleadingly referred to as the "Upper Grille"[1]) connecting via a dog-legged tunnel to a kitchen which opens to a short fire trench T3, that is on the hillside above the larger system's T2 fire trench leading to PB403.

The saga of the sudden loss of the SMR was taken very seriously by the British authorities as evidenced by two hearings, one ordered soon after the surrender by Major General Christopher M. Maltby at a time when the defenders were locked up as prisoners-of-war, and another post war in a British Cabinet inquiry (**Latham 1958**).

Both hearings found that a private soldier, Private William Wylie of the Royal Scots, had locked the Top or Upper Grille, when he left on an errand. The result was that the 10 to 15 defenders inside, including the Company commander of the troops manning the lower SMR, though otherwise mainly members of the HKSRA, could not leave via the sheltered tunnel route to join the fight for the larger part of the SMR. Instead, they were swiftly encircled, attacked with grenades and forced to surrender by attackers of a strength they did not know and likely had over estimated.

Surveyed details of SMR, events of the fight and the associated later enquiries were reported and discussed by **Lai *et al*. (2011)**. In the detailed diagram of the SMR, the first exactly surveyed depiction of the fortification's layout, the fire trenches were numbered from T1 to T9, working anti-clockwise, spiralling from the outer fire trenches to those serving the inner, lower and larger part of the Redoubt. The fire trench where the padlock and other relics were found was in the upper, outer set and numbered T3.

This short note reproduces a translated statement of Yip about his find, and a commentary on that statement.[2] The commentary has two parts. One evaluates Yip's claim based on photographic and other evidence, assessing the extent to which the evidence helps establish the probability that the finds date from wartime and were buried by post-war soil run off into the SMR. The second part is a commentary aimed to connect the finds to the fall of the SMR, and evaluate their most probable provenance. A key interest here is in a padlock, and whether and how it may be related to the problem of the locked "Upper Grille" reported by the defenders.

1 It is uncertain if the post, or the door securing it was called the Upper Grille. It is likely the latter is correct. First, there is the grille gate at the top of the steep flight from the kitchen. Second there is the grille (the trap), which it seems MAY be something like a grille over the emergency exit that rose vertically above the lobby area at the top of the staircase, near the grille door.

2 The interview, conducted in Cantonese, was from 2:30 PM to 3:30 PM on 8 December 2021 in Room KB530, Knowles Building at the University of Hong Kong with the second author, Registered Professional Planner; Alwin Chan, barrister; John Chan, solicitor; Nixon T.H. Leung and Vincent N.H. Chan.

STATEMENT OF YIP

"My name is Cho Wing YIP. "Yip Yung" is my pen name. I was born in Hong Kong and now 49 years old. I have always lived in Sheung Kwai Chung and am a construction work supervisor by profession.

I joined the Royal Hong Kong Regiment in 1993 and left it in September 1994.

I completed tidying up of the Shing Mun Redoubt (SMR) in October 2006 and showed a photo of a lock and another of a shoulder badge of HKSRA in my book A Complete Guide to Hiking around Hong Kong's WW2 Military Ruins (vol. 1: New Territories[3] *(**Yip 2008: p.19**) published in 2008. I actually found three badges but two were subsequently lost.*

I went to the SMR because of Mr. Tim Ko's book and blogs on war relics.

I went there alone. The tools I used included a trenching shovel, a square shovel, a spade, plastic buckets and bags for earth. I cleared the OP, full of mud inside (about 2 feet deep as you can see from the "soil lines" on the walls), from December 2005 to 2006, taking me about 3 months totalling 90 days. The bottom of the stepped tunnel down to the kitchen was blocked by mud leaving only about 1.5 feet below its ceiling. When I was boy, we climbed inside on all fours on the mud.

I first found a way to the kitchen from Charing Cross to the buried firing trench (T3, ed.) to clear the kitchen. The trench (T3) was fully buried by mud and grass. No concrete was visible. I knew that it connected to the kitchen and started clearing the trench so that the mud inside the kitchen could be removed.

It took me 3 months full time to clear the OP and 9 months daily to clear the trench of mud. It took me two years to complete the task. During the period of digging, I was living on my savings.

I worked daily and during the peak periods, I worked 12 hours per day in the SMR.

The mud-filled trench[4] *was full of grass, with five trees each with a diameter of about 20mm.*

The mud removed from the trench (and later the kitchen) was placed on the slope below the left end of the trench. One could see the mud dug out from the Kitchen and the trench and dumped on the slope from the portal of Shing Mun Tunnel from 2008 to 2009. The badges were in the mud.

3 The English title for this book, written mostly in Chinese, reads *Travelling amongst the Hong Kong Mainland Defence Ruins (World War II)*.

4 Yip was shown a hand drawn cross section of T3 and he quickly drew where the lock etc. were located.

The mud inside the trench was cleared from the right hand (e.g. western, Ed.) side section by section.

I was very cautious when the digging was close the bottom of the trench as I was concerned with the possible presence of such things as grenades, which might explode on contact.

The lock and the badges were found about 1 foot right outside the entrance to the kitchen near the bottom of the trench below some khaki colour stuff which I thought was rotten uniform. It was the metallic lock (**Figure 2**)*, surrounded by some webbing* (**Figure 3**)*, that was later identified as of the 1908 pattern (used from 1908 to 1937 by regular troops, but by the Hong Kong Voluntary Defence Corps (HKVDC) and non-combatant units till the Battle of Hong Kong), the badges were near the lock. The lock was wrapped in the webbing, not on its own in the soil.*

Figure 2: Metallic lock adduced by Yung Yip in the interview (note brass keyhole surround and brass swinging keyhole cover)
(Taken by the author on 8 December 2021 during the interview with Yip)

Figure 3: Hardware remnants from WW2 period British Army webbing adduced by Yung Yip in the interview
(Taken by the author on 8 December 2021 during the interview with Yip)

The time of discovery was about 2PM on 9 October 2006. The weather was good. Two of the badges I carelessly threw away with the mud.

I did not take photos of the discovered objects or make any drawings of them. I continued to dig and after finishing, I took them home after wrapping them in a white towel. I used a small brush to rub the mud off very carefully from the badge. The process took about a month to complete." (Translated from a recording in Chinese)

COMMENTARY I: THE POSSIBLE SIGNIFICANCE OF YIP'S DISCOVERY

Recall that the post-battle inquiry in the POW camp and that post-war by the Cabinet established that the OP (probably the gate referred to as the "top or upper grille") was locked from the outside by Private Wylie. (**Lai** *et al*. **2011**) The possible significance of Yip's discovery relates to this locked gate and the question of how it was locked.

It thus needs to be made clear at this point what exactly 'locked' and 'upper grille' mean in this context. It is not certain, because no plans have survived and the SMR was effectively stripped of its metalwork in the immediate post-war period, exactly how the upper part of the SMR was secured. An evaluation of the ruins we see today does allow us to note that the security of the stepped tunnel leading from the lower, kitchen end of the smaller part of the SMR up to the OP[5] was obtained in two places (see **Figures 4** and **5**). First at the right-angled turn from the upper end of the stepped tunnel to the steep, longer lower section by a stout, steel-grilled gate, the "top or upper grille", secured to its frame by a lock. Second, a steel door at the exit from the kitchen to the passageway leading leftwards to T3 and rightwards into the tunnel leading to Charing Cross.

5 The OP was also the company HQ and might well be the Strand Palace Hotel. (Tan 2015)

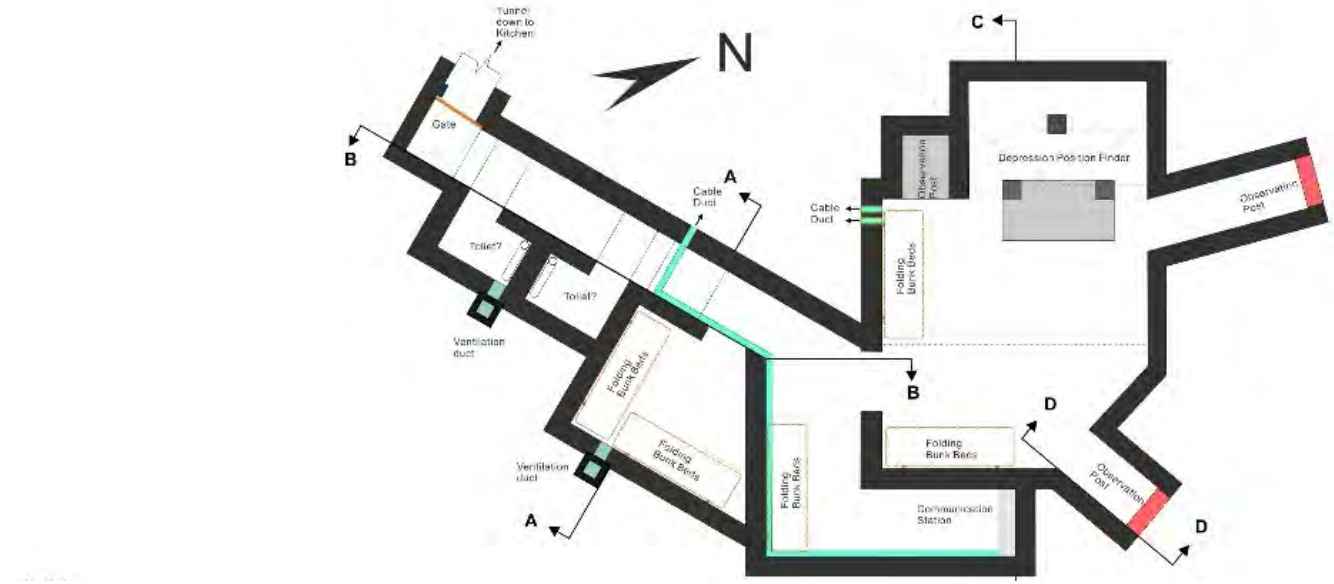

Figure 4: The upper part of the OP showing the gate at the top of the steps down to the kitchen level (Drawn by Y.K. Tan)

Note: This diagram does not show the 'trap' that may have been an alternative exit through the roof.

Surveying and Built Environment Vol 31(1), 105-119 May 2022 ISSN 1816-9554

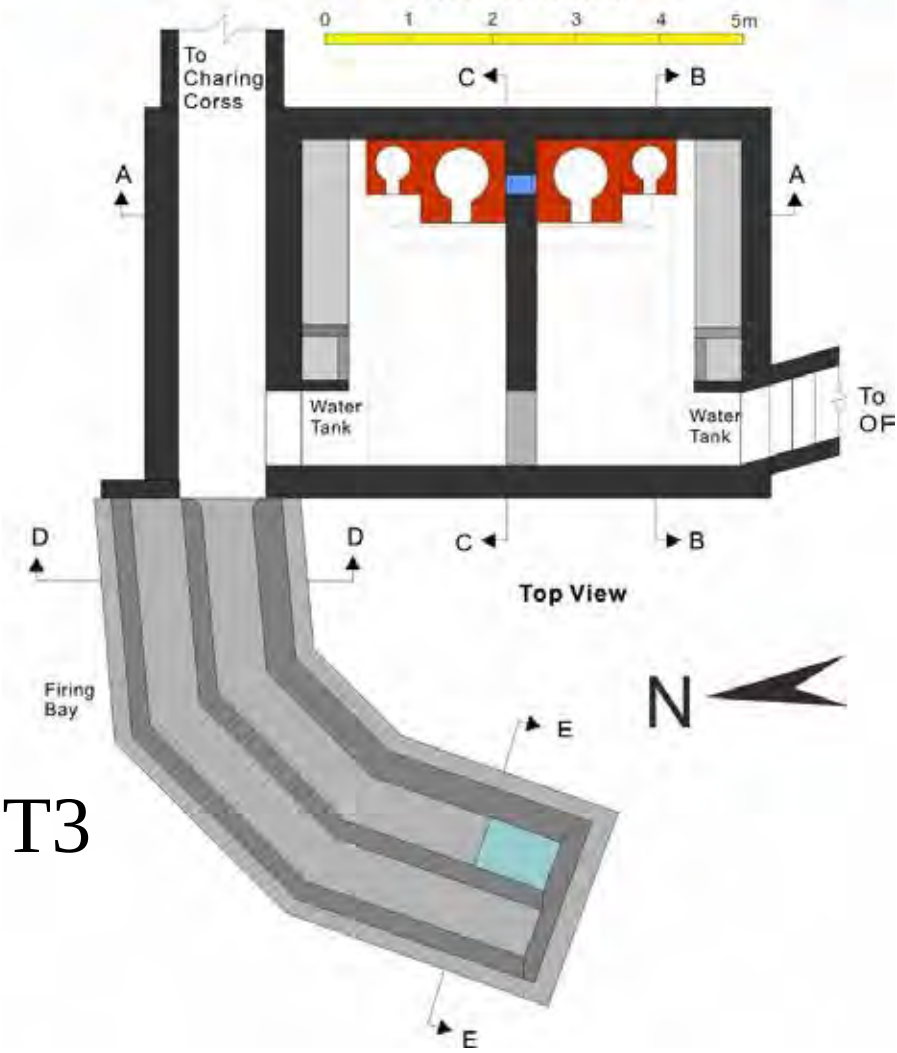

Figure 5: The lower kitchen showing the gate at the exit to T3 and the tunnel to Charing Cross
(Drawn by Y.K. Tan)
Note the ellipse and bar to mark the lower grille gate.

What we do not know for certain is how either of these gates was secured. The possibilities are two. One, as with some known Hong Kong Island pillboxes and other contemporary structures, by a standard mortice-type lock, as shown in **Lai, Davies and Tan** (**2021: p.182**). The other would be a deadbolt with a drop flap over a hasp secured by a padlock, examples of which can also be seen in some pillboxes.

We can see in the present day remains of the SMR, both at the upper gate and the exit to T3 and the tunnel to Charing Cross, signs of the hinges (**Figures 6** and **7**) and steel frame of doors. Too little remains, however, to be clear as to how the doors were locked. We shall return to this aspect below.

Figure 6: Doorway at top of staircase connecting the OP and the kitchen of SMR, showing remaining hinges
(Taken by Y.K. Tan)

Figure 7: Exit from the kitchen of the SMR showing the remaining marks of the hinges of the door to T3 and the tunnel to Charing Cross
(Taken by Y.K. Tan)

Now, a metal lock and a badge of the HKSRA were found in 2006 and their photos appear Yip's book of 2008. The lock Yip produced (**Figure 2**) is very similar to a well-preserved example of a standard, British Army padlock (**Figure 8**) found from the web and to all others of similar design, of varying sizes. These locks, of a four-lever type still used in the British Army, go back to the late 19th century and, at the time of the Battle of Hong Kong, were identified by their Vocabulary of Army Ordnance Stores (VAOS) number.[6] The

6 Mr Chris Jones briefly sketches the history of these types of padlock at https://www.youtube.com/watch?v=aECQGbvi8yI. The Vocabulary of Army Ordnance Stores began life in the late 19th century and by the 1940s had numerous volumes identifying the vast numbers of equipment, from tanks to padlocks, heavy guns to kitbags, vehicles to bedpans that were issued to the army. In 1956 the VAOS numbers were superseded by the modern NATO Stock Numbers or NSNs of the kind exemplified on the lock in Figure 2B.

lock could corroborate the oral evidence of witnesses at the inquiries, supposing that alternative explanations for the presence of the lock where it was found are dismissed. As we shall see, such a dismissal seems unwarranted.

Figure 8: "British Army padlock with key", modern NATO standard pattern no. 910-8188, so post 1956

The obvious weakness, that casts doubt on Yip's own belief that the lock was the lock to which Private Wylie took the key has two aspects. One has to do with the credibility of the objects having lain undisturbed where Yip found them since 1941. We shall turn to that first.

In effect, what follows is an attempt to use aerial photographs to evaluate the progress of the burying of the bottom of T3 in run off earth and subsequent natural plant growth. The 1964 Hunting aerial photos that cover the OP and the fire trench show that the outline of the fire trench was at that time clearly visible. These photos were all taken more than 20 years after the battle. One is shown as **Figure 9**.

Given that early in the 20 years before 1964 soil accumulation would have been far less, a further question as to the lock's provenance is whether the lock and badges might have been dropped after the end of the war? A key point here is that the basic pattern of this lock has been in use in the British Army from the late 19th century through until almost the present day. We shall also revisit this issue below.

Figure 9: The fire trench (T3 in Lai et al. (2011)) in question
(Huntung Surveys Ltd photo No. 4882 dated 27 December 1964)

COMMENTARY II: THE PHYSICAL CONDITIONS OF THE SITE

The second author's first two visits to SMR, accompanied by his colleagues and/or research and undergraduate students, occurred on 20 November and 26 December 2007. On that first visit the kitchen, the trench and the connecting tunnel were found all neatly cleared of earth (see **Figures 10** and **11**). "Soil lines" then visible along the walls of the tunnel, the walls of the kitchen and in the trench clearly indicate that Yip's testimony as regards to the removal of earth is accurate.

To help evaluate the state of affairs of the fire trench and the OP from December 1964 to 2006, the relevant 8-times enlargements of 7 aerial photos, taken vertically at various heights ranging from 1800 feet to 6000 feet, from 1964 to December 2006 obtained from the Survey & Mapping Office were interpreted by unaided eyes by the second author (**Table 1**). The last aerial photo was shot soon after the reported time of the discovery of the lock.

Table 1: **Aerial photographs interpreted by the second author**

Year (Date)	**Aerial photo number (Height of flight)**	**Interpretation of 8 time enlargement of the area of the fire trench from Charring Cross below the "upper grille"**
1964 (27 Dec.)	6448 (1800 feet)	**Figure 4**: The outline of the trench is visible and the fire step is very clean but there are signs of vegetation at the bottom of the trench below the fire step. It appears that earth has been washed into the trench from near its entrance to the Kitchen.
1976 (4 Oct.)	15459 (4000 feet)	The trench is nearly full of vegetation, but the outline if it is still visible.
1979 (15 Dec.)	28583 (4000 feet)	The trench was full of vegetation and the outline is barely visible.
1990 (13 Nov.)	A23639 (4000 feet)	The trench was full of vegetation and the outline is invisible.
2001 (13 Sep.)	CW32668 (6000 feet)	The trench cannot be seen from the air.
2005 (24 Oct.)	CW65530 (6000 feet)	The trench cannot be seen from the air.
2006 (6 Dec.)	CS01574 (6000 feet)	The trench can be clearly seen with newly dug up soil down its left side facing Kwai Chung.

From these photos, it is safe to infer that from December 1964, surface runoff that carried soil gradually filled up the kitchen and the trench (up to the "soil lines" mentioned) until sometime before December 2006 when the trench was cleared by Yip.

COMMENTARY III: THE RELICS

The site photos and SMO's aerial photos corroborate Yip's account of earth removal from the places where the relics were discovered. This supports the claim of the discovery of a lock and badges inside, and towards the bottom of the fill, in fire trench T3.

Much more needs to be done to establish that the lock is one from the war period. It is possible that the lock was dropped post-war or, even if it does date from wartime, that it had some other provenance than securing a

gate. It is very likely a British military lock, since as we noted above, this has been a standard padlock pattern in the British Army, in sizes from small to very large, for over a century. Similar locks were still being issued in the early 21st century and had initially been issued in the 1890s. However, it might also be of Indian manufacture, since copies of the lever padlock of this type (often known as the India Bank padlock) are known to have been made in Aligarh by the early 20th century. It is to be noted here that the lock found by Yip Yung has a swinging keyhole cover in brass, which is more common in Indian made padlocks of this type, than the similar British Army examples which usually had a vertically sliding brass keyhole cover.

From what we know of the post-war deployment of the British Army, the SMR was no longer of active military interest. It was also subject to systematic destruction to deny the use of parts of it to miscreants. It follows that there is a possibility that a standard padlock was used to re-secure either the entrance to the kitchen or the "top or upper grille" to deny the use of the kitchen and OP for squatting or other purposes. It is thus possible that the lock found its way to where it was found when scavengers, stripping metalwork out of the SMR for sale as scrap in the 1950s and 1960s, forced it open.

This raises two issues. There is the condition of the lock that has been found, and the question of whether it was used to secure the Upper Grille, and subsequently forced in order to open the passageway once the battle was over. The other issue is how the gates were fastened and, supposing that to have been by padlock, whether a padlock of the size found would have been used.

It needs to be noted that the remains of the lock do not show any signs of forced destruction of the kind that would have had to occur to remove it once the key had disappeared. Padlocks of this type, looked at from the key side (as in **Figure 1B**), open with the hasp (technically the 'shackle') hinged at the right side and closing and releasing on the left side. The state of these remains show the hasp 'open' in a normal way, with no obvious distortion of the hinge side of the sort one would expect if the lock had been mechanically forced with a lever. Equally, there are no signs of the lock having been blown apart with a gunshot.

It is also manifest that, given there was also a door into the kitchen area from T3 and the tunnel to Charing Cross, and supposing that all doors in this area of the SMR were secured by padlocks, that the lower door may have had another padlock that had not been locked. This would of course have been very much closer to where Yip Yung found the lock in Figure 2A, so might be a more plausible candidate, especially since, on this hypothesis, it would not have been locked and subsequently forced, so would be consistent with the appearance of what has been found.

Much, however, hangs on the dimensions of the padlock. British Army padlocks were sized by the width of the padlock

across the widest part of the body. The smallest in regular issue was a 40mm (1 $^{5}/_{8}$") lock, the largest 100mm (4") or more. In general locks used to secure important doors, if it was a question of a padlock, would have been of the larger sizes. It can thus be argued that the padlock found by Yip, supposing that is how the gates were secured, is likely to have been on the small side.

The presence of the webbing remains and badges of the HKSRA, a unit disbanded post war, with the lock in roughly the same stratigraphic location, does suggest that this is a wartime British Army lock. However, that it is at the smaller end of the size range, and that it was found with webbing and cap badges suggests an alternative provenance. It is known that standard issue to British and, though this is less certain, British Indian troops were brass or steel 'D-rings', secured by c.40mm padlocks, for securely closing kitbags. Given the webbing and accoutrements that formed part of the lock's ensemble, it seems more likely that the lock was connected to an HKSRA gunner's kit than to the securing of gates within the SMR.

On balance we must conclude that although the lock Yip Yung has found may have been the lock of the Upper Grille that played so signal a role in the fall of the Shing Mun Redoubt, it seems improbable. Even supposing it could be shown that both doors to the Strand Palace Hotel were secured with padlocks, too much needs to be explained as to how the lock in question would have ended up, carefully wrapped in webbing and with the badges and webbing hardware where it was found.

By way of conclusion, however, we can aver that whether the lock is the one of which Private Wylie took away the key, when he went on his errand on the evening of 9 December 1941, is in a sense immaterial. The lock's association with the Battle of Hong Kong, with the struggle in the Shing Mun Redoubt and with the men of the HKSRA who fought and died in the OP means the lock is a valuable relic and deserves proper conservation along with the other elements of the ensemble with which it was found.

Figure 10: Fire trench (T3), part immediately outside the Kitchen of SMR
(Taken by the second author on 26 December 2007)

Figure 11: Fire trench (T3), its southern end
(Taken by the second author on 26 December 2007)

REFERENCES

Lai L W C, Davies S N G, Ching K S T, Wong C T C (2011), "Decoding the Enigma of the Fall of the Shing Mun Redoubt Using Line of Sight Analysis," *Surveying and Built Environment*, 21:2, 21-42.

Lai L W C, Davies S N G & Tan Y K (2021), *Pillboxes on Hong Kong Island in the Era of World War II*, Special Issue of Surveying and Built Environment, December.

Latham H B (1958), *Report on the Action of the 2nd Battalion The Royal Scots in the Fighting on the Mainland during the Hong Kong Campaign 8th -13th December 1941*, Prepared at the request of the Chairman of the Battle Honours Committee, Historical Section, Cabinet Office, UK, January 1958. National Archive Ref. CAB 44/175 320817.

Tan Y K (2015), "Where is the Strand Palace Hotel?" *Surveying and Built Environment*, 24:1, 109-122.

Yip Y (2008), *A Complete Guide to Hiking around Hong Kong's WW2 Military Ruins* (vol. 1: New Territories) [Re-translated English title: *A Travel of Hong Kong Mainland Defence Ruins (World War II)*], Rightman Publishing, Hong Kong, 2008. (Chinese publication)

Surveying & Built Environment

FIELD NOTE

A New and Anomalous Observation Post above Shaukeiwan (Shau Ki Wan)

Stephen N.G. Davies*, Lawrence W.C. Lai** and Y. K. Tan***

ABSTRACT

This field trip note describes the external and interior features of a vacant structure, annotated "Fort" on government survey maps, above the Mount Park catchwater within Tai Tam Country Park (Quarry Bay Extension); explores whether it was used as a non-standard observation post or improvised pillbox; and indicates how one may access the site from Tai Tam Road.

KEYWORDS

Observation post, pillbox, OP on Mount Parker, Japanese

INTRODUCTION

This newly discovered structure is significantly different to the standard fixed observation posts (OPs) on Hong Kong Island. At the largest scale of the Lands Department's old 1:600 and latest GeoInfo map, the structure, situated at about 270m above MSL, is labelled "Fort" within Tai Tam Country Park (Quarry Bay Extension). (**Figure 1**)

* Honorary Professor, Department of Real Estate & Construction, University of Hong Kong. Email: stephen.davies79@gmail.com

** Professor, Department of Real Estate & Construction, University of Hong Kong. Email: wclai@hku.hk, proflawrencelai@gmail.com, F.H.K.I.S., F.R.I.C.S.

***Teaching Assistant, Department of Real Estate & Construction, University of Hong Kong. Email: tanyk@netvigator.com

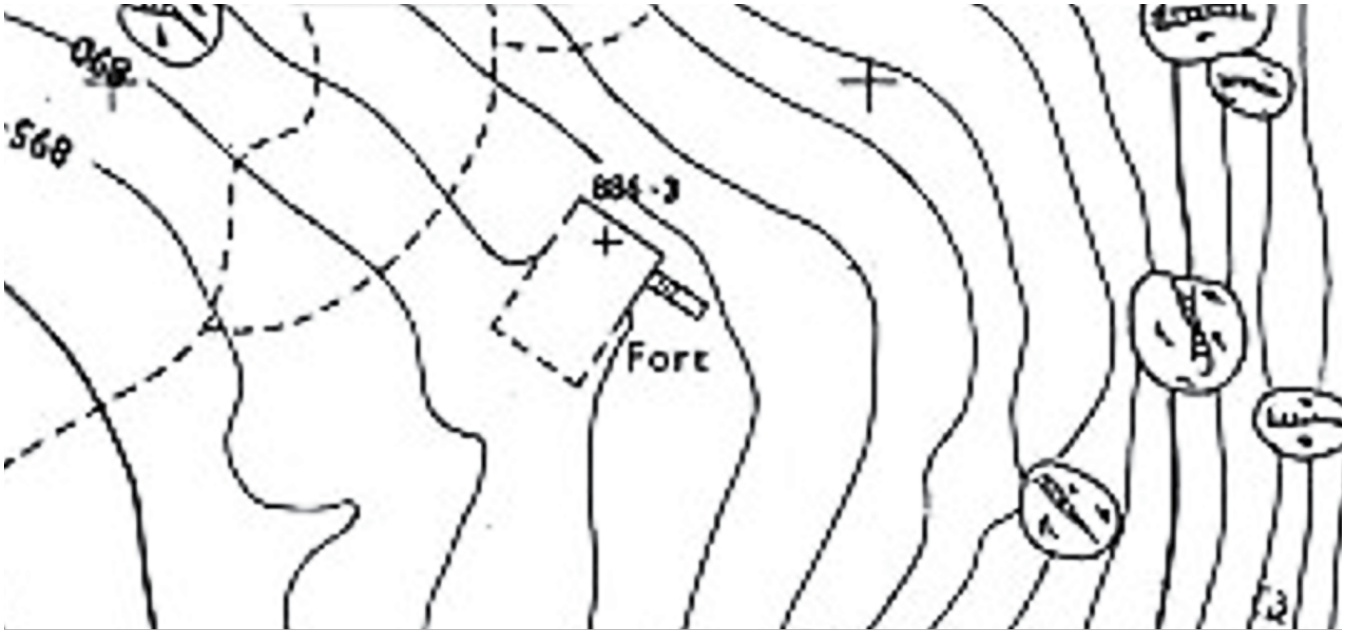

Figure 1: OP Shaukeiwan (Shau Ki Wan) annotated as “Fort” on survey sheet C-214-NE-3, 1965

Surveying and Built Environment Vol 31(1), 120-127 May 2022 ISSN 1816-9554

In documentary sources about Hong Kong's WW2 defence system and the Battle of Hong Kong, a "Shaukeiwan (Shau Ki Wan) OP" is mentioned in a way that distinguishes it from the OP on Mount Parker. Accordingly, the team, on the advice of Robin Weir, searched for an OP in the area around the catchwater on the lower slopes of Mount Parker above Chai Wan Road, more or less where the "fort" is mapped. After enlarging a Hunting Surveys Ltd. aerial photo, it became clear that the "fort" had a ventilation shaft and an OP-like slit opening that faced the eastern approaches to Victoria Harbour (**Figure 2**). Two inspections were made of the structure in late December 2021.

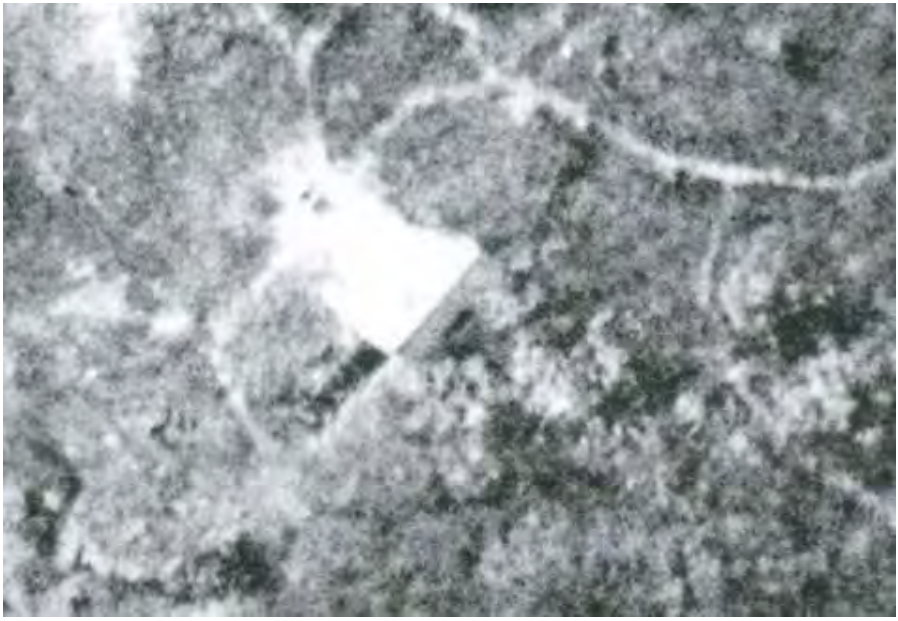

Figure 2: OP Shaukeiwan (Shau Ki Wan) as shown in enlarged Hunting Surveys Ltd. aerial photo (2700 feet) 7080 of 1 February 1963

APPEARENCE

The structure does not conform in any obvious way to the four significant exterior characteristics of Hong Kong Island OPs that the authors have identified in another publication (**this issue, pp.45–104**). It has a simple rectangular footprint, so is quite unlike the triangle-and-square footprint of standard OPs. It is not built of reinforced concrete in the standard manner. There is no heavy, sloping overhead cover to the observation slit, although there is a pronounced bevel to the roof above the opening. (**Figure 3**) The rectangular aperture does not form an angle, as with the standard OPs, although it is not dissimilar to battery observation post (BOP) apertures in Hong Kong's

coastal defence batteries. There are no 'cookies' on the flat surfaces, although the structure was camouflaged by being partially buried – a characteristic of most Hong Kong Island WW2 defensive structures. The ventilation shaft on the roof is square-topped and more like that found on pillboxes (PBs) (**Figure 4**). The most significant anomaly, which we shall address below, is the aperture.

Figure 3: Exterior front view of OP Shaukeiwan (Shau Ki Wan) showing the curious aperture
(31 December 2021 by Lawrence W.C. Lai)

Figure 4: Ventilation openning on roof OP Shaukeiwan (Shau Ki Wan)
(31 December 2021 by Lawrence W.C. Lai)

VISION FIELD

The OP faces across the Lei Yue Mun Channel towards (**Figure 5**), though not directly at a ruined structure at 196m on the west flank of Devil's Peak, thought probably to be an OP associated with Gough Battery. A preliminary evaluation suggests that either this may be a survivor from a much earlier, late 19th/early 20th century episode of the development of Hong Kong's artillery defences. Alternatively, it may be of Japanese origin from the period of the occupation or if not, then modified by the Japanese.

Figure 5: View from rooftop of OP Shaukeiwan (Shau Ki Wan)
(31 December 2021 by Lawrence W.C. Lai)

INTERIOR LAYOUT & FACILITIES

If the exterior appearance and ground plan of the Shaukeiwan OP are quite different to that of standard Hong Kong Island OPs, the interior layout is also different.

Functionally, the working observation aperture is obviously at the front, as with any OP (**Figure 6**). This is the structure's most significant anomaly, which we can now briefly address. On the outside face this is a typical OP aperture – a horizontal slot 3.75 times as wide as it is high. But at that point the similarity to a standard British OP ends. A number of things stand out. First, the sides of

the OP narrow inwards from just inside the outer edges to an inner opening only about forty percent of the width on the structure's outer face. Such inward slanting edges to an opening are very much more reminiscent of a pillbox or small gun emplacement that of an OP. Not only that, the inner opening is 25% greater in its vertical dimension than the outer edges of the full width aperture, its lower edge being dropped by that amount below the line of the outer sill. In addition, the front of the sill of this inner opening extends forward of the main structure's front face, in a sort of hollow square pillar, to create a space outside the main structure perimeter in which a human could stand, or in which a gun mount – for example for a heavy machine gun or light anti-aircraft gun – could be placed. It can be noted that the result of this (**Figure 7**) is that either the observer (if this was an OP), or the weapon, if it was an emplacement, had no overhead cover. **Figure 8** shows clearly that the result of this structure, viewed from the inside, is of the front opening being like a half open stable doorway.

Considering now the rest of the interior, similar to the standard OPs, the ventilation shaft is in a rear corner. However, where standard OPs have the remains of the attachment points for fold-down pipe cots for the OP crew, this OP only appears to have rows of hooks for equipment. An additional and significant difference lies in the location of the entrance. (**Figure 7**) This is at the end of a short approach trench to the front of the structure immediately adjacent to the opening to the observation point.

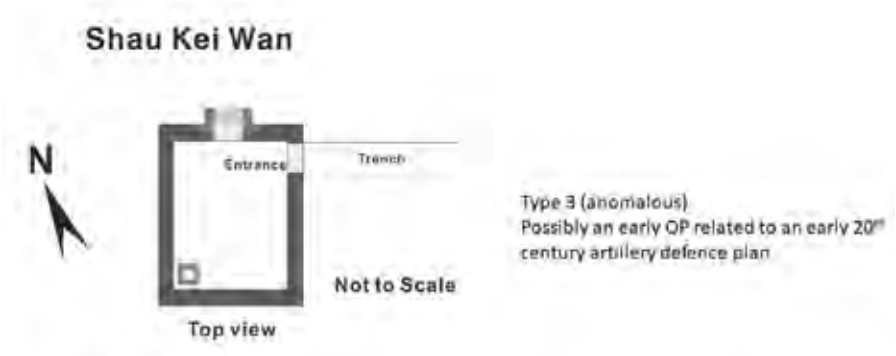

Figure 6: The footprint and interior plan of OP Shaukeiwan (Shau Ki Wan) (not to scale)

Figure 7: Right side view of OP Shaukeiwan (Shau Ki Wan) showing its entrance and the protruding lower part of the observation aperture
(31 December 2021 by Lawrence W.C. Lai)

CONSTRUCTION FEATURES

It is not certain whether the structure was built with reinforced concrete. It may have been, but either instead of, or in addition, the roof is supported by several widely spaced, inverted, rectilinear 'U-shaped' steel frames between which what may have been pre-fabricated concrete slabs (or some such) were placed (**Figure 8**). This perhaps suggests it may have been built in a hurry.

Figure 8: Interior view of OP Shaukeiwan (Shau Ki Wan): note the exposed parts of the steel frames supporting the roofs and the 'door' opening to the observation point
(31 December 2021 by Lawrence W.C. Lai)

HOW TO GET THERE?

To reach this structure, one should approach the north eastern spur of Mount Parker along a path (possibly an old 19th century army patrol path), patrolled by AFCD rangers at the time of our last visit on New Year Eve, at c.250m (which can be reached easily by a track up from the service reservoir above Shan Tsui Court) until more or less directly above Shaukeiwan Fire Station. From the south head northeastwards along the water catchment from between Boa Vista and Mount Parker. From the north, head east south eastwards along the water catchment above Yiu Tung Estate also to above Shaukeiwan Fire Station. From this point, a hikers' path ascends steeply up towards the summit of Mount Parker. The "fort" is mapped on the 270m contour just south of the path at 22^0 16'.275N, 114^0 13'.634E.

CONCLUSION

This is a very anomalous structure. It may be the hitherto unidentified Shaukeiwan OP. However, little about its structure supports this attribution unless the OP was re-purposed in the Battle of Hong Kong period from some relict defence structure originating in an earlier phase of Hong Kong's defence works. The alternative is that this was either adapted from a British structure of uncertain purpose, or purpose built in a hurry by the Japanese occupation forces. One argument in favour of an interpretation of the structure in the state it is today as mainly Japanese, given the possibility that the structure housed an anti-aircraft weapon, would be its position high to the southeast of Taikoo Dockyard, which was a regular target for US Navy and US Army Air Force bombers.

Surveying & Built Environment

FIELD NOTE

A New, Possibly Japanese Observation Post/ Pillbox and Shelter in Hong Kong Park

Stephen N.G. Davies*, Lawrence W.C. Lai** and Y. K. Tan***

ABSTRACT

This field trip note describes the external and interior features of a vacant structure in Hong Kong Park and explains its probable use as an observation post or pillbox and how to get to the site from the Park.

KEYWORDS

Observation post, pillbox, “Mimi Lau” blocks, Battle Box, Battle of Hong Kong

As a consequence of the authors’ re-reading of the Maltby Report (Maltby 1948) during further research into fixed observation posts (OPs) (Davies, Lai & Tan 2022a) on Hong Kong Island, we found a reference to a Kennedy Road OP. Close inspection of survey maps, aerial photographs, and two fairly recent photographs of the exterior and interior of a hitherto undiscussed structure identified in Hong Kong Park (of as yet unknown provenance), suggested a possible candidate for the OP. A subsequent site visit has identified the largely intact remains of the structure, but has led to the conclusion that it is hard to classify both in terms of function and attribution. As we shall see below, there is mapping evidence that it was originally British, with uncertainty as to whether it was or became an OP or a pillbox (PB). However, in British fixed defence structures in Hong Kong, the present structure that exists would be anomalous whichever it was.

* Honorary Professor, Department of Real Estate & Construction, University of Hong Kong. Email: stephen.davies79@gmail.com

** Professor, Department of Real Estate & Construction, University of Hong Kong. Email: wclai@hku.hk, proflawrencelai@gmail.com, F.H.K.I.S., F.R.I.C.S.

***Teaching Assistant, Department of Real Estate & Construction, University of Hong Kong. Email: tanyk@netvigator.com

1 It is described as a Japanese pillbox at https://gwulo.com/node/1802, with an absence of documentation or reasoned argument.

The remains are located just below a chain link wire fence close north of a sharp, almost 'U' bend in Kennedy Road. This was within the old purlieus of Victoria Barracks and, post-war, immediately above the Headquarters British Forces building. It now lies within the boundary of Hong Kong Park and is directly west of the public toilets off Justice Drive and south of the first fountain in Hong Kong Park **(Figure 1)**.

Figure 1: The location of the wartime structure in relation to the British Battlebox headquarters (base map courtesy www.map.gov.hk)

In WW2 terms as shown in **Figure 1**, the structure was some 50m to the west of the southwest corner of the Battle Box, which was the British headquarters during the Battle of Hong Kong. Remains of what may have been a light anti-aircraft machine gun (LAAMG) position lie close NNW of the entrance of the present structure. It is possible there was an LAAMG post protecting the Battle Box in this position. On a 1968 1:6000 Lands Department map, which shows the structure, an access path (**see Figure 1**) leads downwards towards the road through Victoria Barracks and the eastern end of the main headquarters building, which was above and slightly south of the Battle Box. After the surrender, and with the Japanese armed forces taking over the British military installations, both structures, of course, could have been either co-opted and modified by, or have been built by the Japanese.

Access to this structure is to be had from the entrance to Hong Kong Park from Justice Drive. Walk down the path towards the fountains. On the left, just before the path opens to pass around the second fountain, on the far side of the small hedge and grass area, there is a concrete access path to the right leading up to Kennedy Road. To the left, up an earth slope, a drainage channel leads to a wide (about 2m) upper platform of a

large retaining wall (**Figure 2**). Follow the second flight of maintenance steps that lead uphill on your right. This takes one up to a locked up fence door on Kennedy Road. Before that point, when the steps reach tree no. CA1769 TS030, turn right along a maintenance path and down some steps (which go down to the platform). On the left is a trench/ passageway leading to the structure.

Figure 2: The retaining wall
(8 February 2022 by Lawrence W.C. Lai)

Images of the structure's interior and exterior show it to be quite unlike either the Type 1 or Type 2 OPs the authors have identified as being the standard, British pre-war design and build, fixed OPs on Hong Kong Island. The evidence, such as it is, points to this not being the British Kennedy Road OP, of uncertain origins, and probably having significant connection to the Japanese occupation.

Recent mapping evidence identified by Y.K. Tan shows clearly that a structure in roughly this position, with access stairs off Kennedy Road close to where the present approximately south to north access stairs are, existed as early as 1924.Work in reconciling this 1924 map with to present day maps and the structures that now exist is ongoing. However, as noted below, this recent discovery seems solid evidence of a probable British origin for the initial structure. What the original purpose of the structure was we do not yet know (**Figure 3**).

The structure as it is today has three embrasures set on the sides of an irregular hemi-cylinder that forms its front part. Above the front edge is a row of cut, uneven granite setts topped with a low, domed cap in concrete and large aggregate (**Figure 4**). This fronts a piled earth cover over a rear chamber, which in turn is reinforced on its sides by laid granite stonework revetments (**Figure 4**), on which more below.

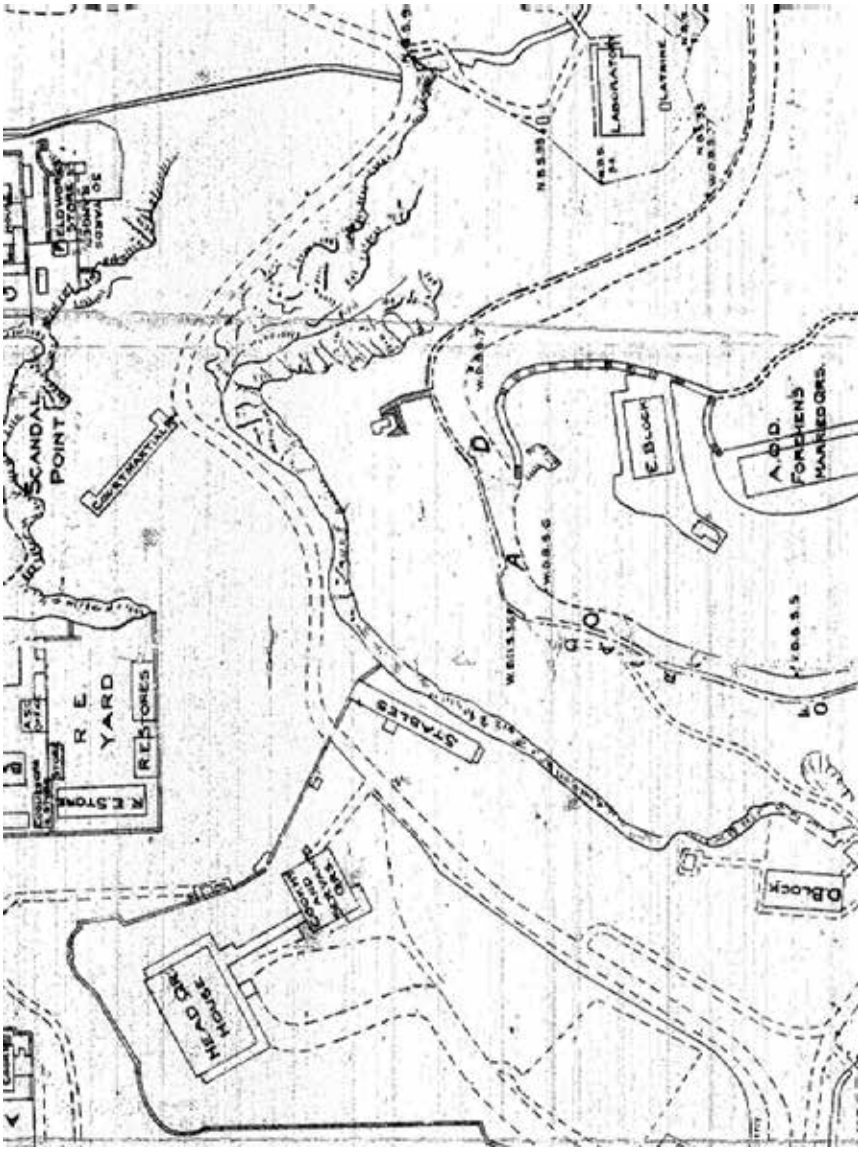

Figure 3: 1924 Cantonment of Victoria v.36 (1:1200), the original structure

Figure 4: A side view of the front of the structure showing two of its embrasures, its granite block-capping and the stone revetments of the rear chamber
(8 February 2022 by Lawrence W. C. Lai)

Access is from a sunken path, which curves around the front of the embrasures to enter to the right of the hemi-cylinder down a short flight of steps before turning left to enter the rear of the hemi-cylinder, which does not seem to have been secured by a door (**Figure 5**).

Figure 5: A side view of the front of the structure showing its entry
(8 February 2022 by Lawrence W. C. Lai)

The interior of the OP is divided into two parts (**Figure 6**). The front irregular hemi-cylinder, with straight walls joining a flat ceiling at right angles, has the three embrasures (**Figure 7**). The most important distinguishing feature of the embrasures is the steep upward angle, c.45^0 to 50^0, of the outside top edge of the opening and an equivalent downward slope to the inside, lower edge. This would have allowed observers to look upwards into the sky. Accordingly, along with the implicit c.200^0+ field of view around the north-northeast axis, the almost eye level placement of the embrasures to those standing inside, and the absence of any sort of shelf inside the embrasures, thus allowing an observer to stand right against the inside wall with his head within the embrasure opening, argues that an important purpose of this OP may have been the observation of enemy aircraft, in addition to observing the central and eastern waterfront and Victoria Harbour beyond (**Figure 8**).

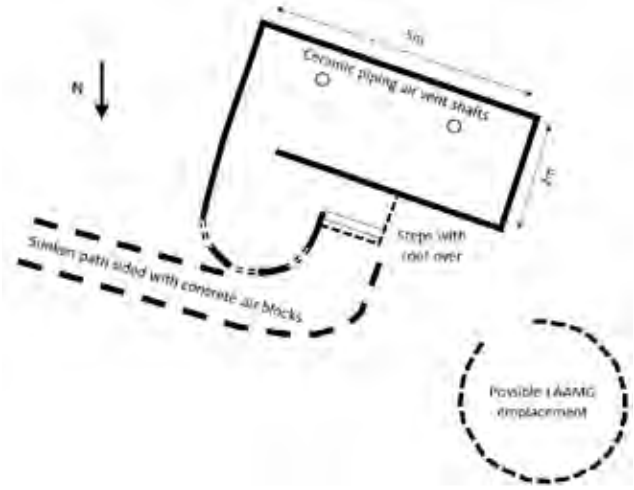

Figure 6: The interior plan of OP Kennedy Road (not to scale)

Figure 7: The three embrasures seen from within the structure
(8 February 2022 by Lawrence W. C. Lai)

Figure 8: View of the Harbour from the roof of the structure with a rectangular, low-walled, open-backed location (possibly a LAAMG post) on the right
(10 February 2022 by Lawrence W. C. Lai)

Figure 9: Roof of the structure showing two ventilation shafts made of drainage pipes and part of the possible LAAMG post
(10 February 2022 by Lawrence W. C. Lai)

Behind the front chamber, dug back into the hillside and orthogonal to the main, north-northeast axis of the hemi-cylinder, is a rectangular chamber some 5m long by 2m wide (**Figure 6 above**). The entrance is from the right rear of the front chamber. The entrance and roof of the rear chamber are chamfered where the walls meet the ceiling. This is a feature not found in British WW2 defensive structures, though something similar is found in the Japanese built defensive structures at Luk Keng in the northeast New Territories.

The roof is flat and made of reinforced concrete of unknown thickness. The ceiling has two openings towards the back (south) wall, which emerge on top in ventilation shafts – now without tops – which were created using brown, ceramic pipe of the kind used in some pre-WW2 building drains. The top of the structure, pending more exact

survey, has around one to one and a half metres of earth piled on it (**Figure 9**). On the eastern end, in line with the hemi-cylindrical front and above the east end of the main chamber, are the remains of a low, rectangular wall, very crudely built from rectangular dense concrete aggregate blocks (in US usage concrete masonry units (CMUs)), some simple rectangles, some 'L'-shaped.[1] This type of construction material seems to have become more common during the 1930s and was clearly in use in Hong Kong by WW2. The examples around this structure, and in the sunken path leading to the structure's entrance, are all examples of a notorious Hong Kong variant, associated with a corruption scandal in 1941, quite inappropriately named "Mimi Lau" blocks.[2] We know such blocks were used by the British in the construction of emplacements.[3] **Figure 10** shows a LAAMG gun and **Figure 11** a howitzer gun position at Tai Tam Fork.

Figure 10: A LAAMG gun position at Tai Tam Fork
(12 November 2020 by Lawrence W. C. Lai)

2 For the use of breeze blocks in Hong Kong buildings see https://zolimacitymag.com/hong-kong-modern-heritage-part-xii-breeze-blocks/

3 For an excellent and even-handed version of the scandal and the origin of the name, see Philip Cracknell's excellent blog, http://battleforhongkong.blogspot.com/2014/09/wing-commander-alfred-horace-steel.html

4 See for an example in the Tai Tam area, http://battleforhongkong.blogspot.com/2014/11/battle-for-hong-kong-walk-through.html

Figure 11: A howitzer gun position at Tai Tam Fork
(10 November 2020 by Lawrence W. C. Lai)

The whole edifice is made of reinforced concrete, with the quality of the reinforcement in the rear chamber appearing better than that of the front chamber. Indeed expert opinion in our research group is of the view that the reinforcement is probably British. By contrast the construction of the front chamber is fairly crude. This view is now strongly backed by the discovery of the structure on the 1924 map shown in **Figure 3**.

As noted the front chamber is an irregular hemi-cylinder that we initially took to be a semi-hexagon. Closer inspection showed the eastern side and front wall and embrasures form the arc of a circle, the radius of which tightens on the north west corner, with the left side (west) embrasure and wall being almost straight, forming the left of the entrance. Only a detailed survey will establish the exact shape. However, this irregularity does tend to support the hypothesis that the front part of the structure may have been an occupation period 'add-on'.

Thanks to the discovery of the 1924 map, we can accordingly conclude that the structure originally comprised a British built shelter set into the hillside possibly near a later anti-aircraft position. After the surrender, it may be that the Japanese occupying forces adapted the original shelter by adding the front, three-embrasure observation post, additionally reinforcing the rear chamber by the

chamfer at the ceiling (**Figure 11**), as well as burying it beneath its present earth covering, with its granite block revetments, and piercing the ceiling to add the ventilation shafts, for which they used drainage pipes sourced *ad hoc*.

Figure 12: The rear chamber with pillaged "Mimi Lau" blocks serving as seats (10 February 2022 by Lawrence W. C. Lai)

Although the exact provenance and purpose of this structure remain uncertain, it seems clear that the nucleus was British, and that what we see today was a Japanese defence structure. The structural modifications, the emphasis on the observation of the sky, along with what may possibly be the remains of light anti-aircraft gun positions to the left front and on top of the OP, given the constant allied air raids on Victoria Harbour from October 1942 until June 1945, gives a Japanese attribution additional plausibility. Further work on this structure is ongoing.[4]

ACKNOWLEDGEMENTS

The authors are indebted to Sr Dr Ken S.T.Ching for geo-referencing the structure based on the 1924 map shown in Figure 3.

4 It is possible that the mention of a "Kennedy Road Special OP" in Maltby's report was a post-war, confused reference to the known Kennedy Town Special OP associated with PB69, about which we have so far no information bar a probable location.