

THE KIANGNAN ARSENAL IN THE ERA OF REFORM 1895-1911

THOMAS L. KENNEDY

Washington State University

Historical Introduction 1865-95*

At the close of the Sino-Japanese War of 1894-95, concerned Chinese officials serving in the imperial government in Peking and in the Liangkiang provincial government frankly acknowledged that the development of the Kiangnan Arsenal had, thus far, been a grave disappointment. Established at Shanghai in 1865, Kiangnan had augured well for the development of a modern munitions making capability in China. Through the initiative of its founders, Li Hung-chang and Tseng Kuo-fan, the arsenal was promptly staffed with a cadre of highly paid foreign technicians, and equipped with a costly plant for foreign machinery for the construction of steamships and production of foreign-style small arms and ammunition. Within several years after

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Throughout the notes I have used the following abbreviations:

- BPP British Parliamentary Papers; this will be followed by annotations indicating the series and the folio.
- CCKT I *Chung-kuo chin-tai kung-yeh-shih tzu-liao* (Materials on the history of modern Chinese industry), Vol. I, (1840-95), ed. Sun Yu-t'ang, Peking: K'o-hsueh ch'u-pan-she, 1957.
- CCKT III *Ibid.*, Vol. III, ed. Ch'en Chen, Peking: San-lien shu-tien, 1961.
- CWHK Chang Chih-tung, *Chang Wen-hsiang kung ch'üan-chi* (The complete works of Chang Chih-tung), Taipei: Wen-hai ch'u-pan-she, 1963, including:
- CWHKTI memorials, 72 chüan;
- CWHKTTS telegraphic memorials, 13 chüan;
- CWHKTT telegrams, 80 chüan;
- CWHKKT public papers, 36 chüan;
- CWHKSC letters;
- HFT *Hai-fang Tang* (Maritime defense archives), Kuo Ting-ye et al. ed., Nankang: Institute of Modern History, Academia Sinica 5 Vols., 1957.
- KNCTCC *Chiang-nan chih-tsao-chü chi* (The record of the Kiangnan Arsenal), Wei Yun-kung ed., Shanghai: Wen-pao Shu-chu, 10 chüan, 1905.
- LWCK Li Hung-chang, *Li Wen-chung kung ch'üan-chi* (The complete works of Li Hung-chang), Taipei: Wen-hai ch'u-pan-she, 1965, including:
- LWCKTK memorials, 80 chüan;
- LWCKPLHK letters to fellow officials, 20 chüan;
- LWCKHCHK letters to the Navy Yamen, 4 chüan.
- NCH *The North China Herald and Supreme Court and Consular Gazette*, Shanghai, 1872-1941.
- PYKTLT *Pei-yang-kung-tu lei-tsuan* (Collected public papers of the Northern Commissioner), Kan Hou-tz'u, ed., 1907.
- PYKTLTHP *Pei-yang kung-tu lei-tsuan hsu-pien* (Further collected papers of the Northern Commissioner).
- YWYT *Yang-wu yun-tung wen-hsien hui-pien* (Collected documents on the foreign matters movement), Yang Chia-lo, ed., Taipei: Shih-chieh shu-chü, 8 Vols., 1963.

establishment, Kiangnan was endowed with a rich annual income from 20% of the Shanghai Maritime Customs proceeds taken from the 40% regularly forwarded to the Board of Revenue in Peking. A foreign language school and technical training program for Chinese youths was established at the arsenal and a translation bureau employed Chinese and foreign personnel to translate western books on science and technology. During the first few years after establishment, the arsenal concentrated on production of small arms and ammunition for supply of the government forces battling the Nien Rebels. After the pacification of the Nien in 1868, the primary mission changed from rebellion suppression to foreign defense. Shipbuilding then took over the most important place in Kiangnan's operations. ①

Like all weapons manfactories in imperial China, Kiangnan was entirely owned and operated by the government. In practice, the power to control production and finance rested with the governor general of the Liangkiang Provinces who served concurrently as commissioner for maritime defense of the southern coast. Depending on who was incumbent in this post, Li Hung chang, the governor general of Chihli Province and commissioner of maritime defense of the northern coast from 1870 to 1895, also had a decisive voice in the arsenal's affairs. After the death of Southern Commissioner Tseng Kuo-fan in early 1872, officials

① *LWCKTK* 9: 31-5. Yung Wing, *My Life in China and America*, (New York: Henry Holt, 1909), 160-64. Tseng Kuo-fan, *Tseng Wen-cheng kung ch'üan-chi* (The complete works of Tseng Kuo-fan), (Taipei: Shih-chieh Shu-chu, 5 Vols., 1964,) 808-9. *Shang-hai hsien-chih* (History of the Shanghai District), Yü Yüeh, ed., 32 chuan, (1871), 2: 28-9. Knight Biggerstaff, *The Earliest Modern Government Schools in China*, (Ithaca, 1961) 165-6. *HFT* III, 27-8, 51-2, 55-7, 101. *YWYT* IV, 28-34, 37-41.

who held the southern commissioner's post from then until 1879 were disposed to heed Li's counsel regarding Kiangnan's operations. Li was dissatisfied with the high cost of foreign materials and manpower required for naval construction and the inferiority of Kiangnan-built vessels compared to those of foreign construction. After Tseng's death he slowed down shipbuilding operations, suspending them entirely after 1875. In 1876, a new British ordnance engineer, Mr. Mackenzie, was hired by Kiangnan and, under his guidance, the arsenal was converted from a shipyard to an ordnance plant devoted chiefly to the production of muzzleloading Armstrong coastal defense guns and ammunition. The production of breech-loading Remington single-shot rifles and black powder cartridges, begun in the early 1870's was also continued. ②

The suspension of shipbuilding at Kiangnan was part of a larger strategy for national defense which gave first priority to the establishment of a fleet in North China for defense of maritime approaches to the capital. Shen Pao-chen, who had been appointed southern commissioner subsequent to the 1874-75 maritime defense crisis with Japan, joined Northern Commissioner Li in active support of this policy. To hasten the establishment of the northern fleet, he relinquished the funds appropriated for southern maritime defense to Northern Commissioner Li so that the required vessels might be purchased as quickly as possible.

② Thomas L. Kennedy "Industrial Metamorphosis in the Self-Strengthening Movement: Li Hung-chang and the Kiangnan Shipbuilding Program." *Journal of the Institute of Chinese Studies* (Hongkong 1971). Kan Tso-lin, "Chiang-nan chih-tsao-chu chih chien-shih", *Tung-fang tsa-chih* (Eastern miscellany), XI (1914), 5: 46-48; 6: 21-25. Demetrius Boulger, *The Life of Sir Halliday Macartney*, (London: 1908) 188-243. KNCTCC 3: 7,

Nevertheless, by 1879, Li had made little headway in establishing a fleet in the North. Provinces designated to make annual contributions of funds for maritime defense had failed to do so and those funds were received had to be employed, in large measures, for relief in the famine-stricken provinces of Shansi and Honan during 1877-78. ③

In 1877, Southern Commissioner Shen, discouraged by Li's lack of progress in establishing the North China fleet and concerned over the inadequacy of naval vessels for defense of the mouth of the Yangtze. Petitioned the imperial government to return to the South the maritime defense appropriation which he had relinquished to Li. His intention was to employ these funds, at least in part, to resume construction of medium-sized military steamers at Kiangnan. Shen's request was granted but he died in 1879, before plans for resumption of construction materialized. Shen's successor in the post of southern commissioner, Liu K'un-i, also favored development of a southern fleet. Some of the medium sized steamers, he thought should be built at Kiangnan. Responding to the pressure for improved naval defense in the south resulting from the 1880 crisis with Japan over the Ryukyus, Liu moved ahead with plans for the resumption of shipbuilding at Kiangnan despite Northern Commissioner Li's recommendations to the contrary. Tso Tsung-t'ang, who, in late 1881, succeeded Liu in the post of southern commissioner, was an earnest advocate of southern naval development. During his incumbency, the south's appropriation for naval defense was employed to finance the resumption of shipbuilding at Kiangnan. ④

③ YWYT I, 153-55, 162-65. YWYT II, 378. LWCKTK 31: 10.

④ YWYT II 378-80, 508-9, 535-6. YWYT IV, 51-2, 62. *Liu K'un-i-i-chi* (A posthumous collection of Liu K'un-i's writings) (Peking: Chung-hua shu-chu, 1959), shu-tu(letter)8: 1.

Only one vessel had been completed by late 1885 when naval reorganization subsequent to the Sino-French War again put an end to shipbuilding at Kiangnan. The Navy Yamen was established in September 1885 and charged with the organization of a national navy with first priority emphasis on the development of a northern fleet. It was given general authority to supervise and coordinate the modernization of equipment in all arsenals and shipyards and control of all maritime defense appropriations. Northern Commissioner Li Hung-chang was named associate controller of the new yamen. Li quickly made it clear that maritime defense appropriations would no longer be available for the finance of shipbuilding at Kiangnan. From that time until 1905, the shipyard at Kiangnan was devoted entirely to maintenance and repair. ⑤

During the late 1870's and the early 1880's, the income from the Shanghai maritime customs, the mainstay of Kiangnan's annual budget, was devoted almost entirely to the production of small arms ammunition, mines and Armstrong coastal defense guns with the last occupying the most important place in production. During these years, Kiangnan was the only plant in China attempting to produce modern ordnance. Its production was, for the most part, disappointing. The Remington was obsolete by the early 1880's. A modified version was introduced in 1884. Several thousand of these weapons were produced and placed in storage each year until 1890 when they were tested and found to be unsafe to operate. The Armstrong coastal defense gun was adopted by Kiangnan largely because of the preference expressed by Northern

⑤ YWYT III, 1. LWCKHCHK, 1: 10. YWYT II, 567.

Commissioner Li. Li favored the Armstrong because it was the strongest and therefore the safest to operate of the several models then employed in the West; but it was also the heaviest, the most cumbersome, and the most difficult to operate. Rationalization of heavy gun production, in the late 1880's and 1890's, required that the Armstrong be replaced by more easily operated breechloading models and eventually by lighter quick-firing models suitable for shipboard use as well as employment in coastal defense forts. Experience in the Sino-French War showed another serious deficiency in Kiangnan's ordnance production: the arsenal lacked the capability to produce a modern light artillery piece suitable for employment by ground forces. ⑥

In the decade between the Sino-French and the Sino-Japanese Wars, the Kiangnan Arsenal, under the supervision of Southern Commissioners Tseng Kuo-Chuan and Liu K'un-i, embarked on a program of modernization aimed at up-dating and improving its production of arms and ammunition. Northern Commissioner Li, by virtue of his post as associate controller of the Navy Yamen and as a result of his close association with management officials, once again, began to play an important role in decision making at Kiangnan. Beginning in the late 1880's, a whole series of steps were taken to modernize arms and ammunition production. A plant for the production of prismatic brown powder required for coastal defense projectiles was established. A new British ordnance engineer was employed and production of breech-loading coastal defense guns and quick-firing guns was inaugurated; by 1895, output had reached one or two of the former and as many as

⑥ *YWYT* IV, 44, 47, 50, 54, 57, 61-2. *LWCKPLHK* 20: 4-5. *KNCTCC* 3: 1; 7: 10; 3: 13, 14, 16, 63-7.

six of the latter per year. In the early 1890's, at the behest of Northern Commissioner Li, Kiangnan designed and began production of its own magazine rifle to replace the defective Remingtons. Production was accomplished with modified Remington machinery and manual labor. Though Li praised this weapon highly, it eventually proved to be inferior in performance not only to foreign rifles, but even to others made in China. Ultimately it had to be discarded because of safety hazards experienced during firing. Production of smokeless powder for rapid fire ammunition and refining of ordnance steel were also initiated during the early 1890's. Both of these projects experienced serious technical difficulties during the planning and initial production stages and neither steel nor smokeless powder was being produced in significant quantities by 1895. ⑦

At the time of the Sino-Japanese War, Kiangnan's annual production of arms and ammunition amounted to no more than a handful of coastal defense and quick firing guns, about a thousand inferior magazine rifles, several tens of thousands of rounds of gun ammunition, and several million rounds of rifle ammunition. Most of the ammunition was for employment with out-of-date weapons. Kiangnan had developed the capability to produce only very limited quantities of modern arms and ammunition and much of what was produced was inferior or obsolescent. ⑧

The reasons are not hard to find. The arsenal was established in a social and economic setting entirely lacking the resources for the

⑦ *YWYT* III, 52-3, *LWCKTK* 77: 1-4. *KNCTCC* 3: 63-72; 76: 18-39; 1, 2: 33-7. *CWHKT* 15: 29-34. *NCH* June 9, 1893; April 26, 1895; July 16, 1897. *CCKT* III 78.

⑧ *CCKT* I, 296; 297. *CWHKTI* 38: 4.

development of modern industry. Raw materials such as coal and metals had to be purchased, almost entirely, from abroad. Prices were high to begin with; transport and insurance charges made them even higher. Domestic personnel resources were lacking. The introduction of each new production technique required the hiring of new foreign technicians and engineers. The Kiangnan technical training program offered an opportunity to only a handful of youths and training was limited to routine subjects such as mechanical drawing. The curriculum did not include the thorough grounding in the principles of modern technology necessary for the development of new systems of production. ⑨

The officials who guided the arsenal's operations were, for the most part, untrained for their positions as managers of modern industry. They oftentimes tolerated or promoted personnel policies and purchasing practices which resulted in large-scale waste of Kiangnan's resources. For example, there is ample evidence to show that, by the 1880's, the management of the arsenal was controlled by a clique of officials from Hunan, the home province of founder Tseng Kuo-fan. Each new director brought with him a staff of thirty or forty highly paid personal favorites who swelled the arsenal's payroll without increasing its production capacity. When such additions were made, no reduction in existing staff took place. As a result, by 1895 personnel expenses were consuming approximately 60% of the income from customs. Furthermore, it was charged that certain arsenal officials regularly exacted personal fees from salesmen several times before the conclusion of a purchase. Prices of materials which were already very high were jacked up even

⑨ *KNCTCC* 2: 34. *CCKT* III, 79. Biggerstaff, 177.

further to cover the payment of such fees. Equally disastrous was the practice whereby unscrupulous merchants took advantage of the ignorance of arsenal officials and made delivery of materials that were substandard in quality or not as specified by contract. Deceit of this type resulted in great amounts of materials purchased at high prices standing useless for years and finally being declared scrap. ⑩

The wasteful and costly personnel and purchasing practices of the arsenal's management combined with the high cost for foreign materials and technicians resulted in skyrocketing costs. Between 1876 and 1885 materiel and manpower expenses accounted for about 75% of all expenditure; in the period from 1890 to 1895, the figure rose to 87%. The lack of proper equipment for the production of small arms and the total lack of equipment for production of ground forces guns can be explained by the fact that the production cost of the few inferior or obsolete weapons which Kiangnan made consumed such a large portion of the arsenal's income that there was little or nothing left with which to supply these important needs. ⑪

Aside from the problems of materiel, technical manpower, and inept management, Kiangnan faced another problem perhaps most dangerous of all—its location. In the 1860's, the arsenal had been established in the maritime city of Shanghai for strategic reasons which derived from its logistical mission in the suppression of the Taiping Rebellion. During the years from 1868-1875, while Kiangnan functioned primarily as a shipyard, Shanghai was a highly appropriate location. Furthermore, Shanghai offered convenient access to markets for foreign materials and, through

⑩ CCKT III 75-77.

⑪ KNCTCC 4: 6-8.

the many foreign firms represented in Shanghai, it was relatively simple to obtain foreign technicians which the arsenal relied on for key positions.

Despite these apparent advantages in the location at Shanghai, the arsenal site in that city was exposed and vulnerable to attack from foreign naval forces which enjoyed naval superiority in China's coastal waters. This vulnerability was highly inconsistent with Kiangnan's mission of strengthening China's coastal defenses and armed forces to withstand foreign attacks. Kiangnan's vulnerability was a source of worry to the northern and southern commissioner from the mid 1870's; nevertheless, the immensity of the problem of relocating the arsenal and the convenience offered by the location in Shanghai resulted in their taking no action. Experience during the Sino-Japanese War raised the problem of Kiangnan's vulnerability again this time, with a new urgency. Several times, the Japanese were reported to be on the verge of attacking the arsenal and it was only through intervention of the Western Powers that Shanghai was declared a neutral zone and Kiangnan was saved from destruction. ⑫

By the end of the war in 1895, there were four major problem areas affecting Kiangnan's operation: dependence on costly imported raw materials; dependence on foreign technicians; inept management; and strategic vulnerability. Solutions to the problems of raw materials supply and technical manpower could not be achieved by policies implemented at Kiangnan alone. These shortcomings were symptomatic of economic and educational underdevelopment at the national level. Their full solution

⑫ *LWCKTK* 24: 13-25. *KNCTCC* 2: 31-32. *CWHKTT* 19: 31. *KCH* Jan. 11, 1895.

would come only with the improved exploitation of domestic mineral resources and modernization of the national educational system. On the other hand, the solution to the problem of inept management (i. e., the failure to employ most effectively those resources which Kiangnan did have), could be achieved largely through a reorganization and clean-up of arsenal administration. Similarly, Kiangnan's strategic vulnerability could be remedied either by strengthening local maritime defense or by relocation of the arsenal at a protected inland site.

In the post-war era, as imperialist pressures intensified and the development of strategic industrial potential took on a life or death criticality for China, certain officials who directed the affairs of Kiangnan launched an all out struggle to improve management and remedy the arsenal's strategic weaknesses. Arsenal leaders even moved to improve technical training. However, educational reform was patently a multi-faceted problem requiring coordinated action at the national level. And coordination was not an easy task in the government bureaucracy of late Ch'ing China. Indeed, it was in this area that Kiangnan's leaders encountered a new problem. As other arsenals began production of modern small arms, how would the standardization of bore diameters, essential for national military unification, be accomplished? The attempt to cope with all of these problems at Kiangnan, during this decade and one half, was essentially an effort to strengthen the keystone of China's infant military-industrial complex. To follow the operations and observe the changing role of the arsenal during this period is to witness the bureaucracy of the aging Ch'ing Dynasty struggling to revitalize the imperial system in the face of ever intensifying crisis. Though the outcome of the struggle is well known, only recently have

we begun to understand the forces which directed the final verdict of 1912. An analysis of the experience at Kiangnan can further illuminate this problem, for Kiangnan epitomized the military-industrial complex of the late Ch'ing times. Its affairs commanded the attention of the leading statesmen of the day and its operations consumed as much as 2% of annual national expenditure.

The Post-war Struggle for Control 1895-96

From late 1889 until early 1896, the Kiangnan Arsenal was under the direction of Liu Ch'i-hsiang. Liu was a relative of Li Hung-chang and the scion of a distinguished Hunan family. His father, Liu Jung, had come from the same hometown in Hunan as arsenal founder Tseng Kuo-fan and the senior Liu had distinguished himself, during the Taiping Rebellion, as an officer in Tseng's Hunan Army. Liu Ch'i-hsiang brought to his post energy and enthusiasm; under his leadership, Kiangnan modernized gun production, developed the new magazine rifle and began the production of ordnance steel, smokeless and brown powder. Nevertheless, it was during Liu's tenure that the most serious deterioration in personnel and purchasing practices took place. By 1895, personnel costs had risen almost 25% from 1890 and consumed almost 60% of the customs allotment. Chinese newspapers charged Liu with gross malfeasance in office, including purchasing arsenal materials privately at a low price and then reselling them to the arsenal at a much higher price. During most of Liu's tenure as director of Kiangnan, he was under the supervision of Southern Commissioner Liu K'un-i, another prominent Hunanese, whose background was quite parallel to that of Liu Ch'i-hsiang's father, Liu Jung—though

more distinguished. Liu Ch'i-hsiang was widely regarded as a protege of Liu K'un-i. ⑬

The status quo at Kiangnan was disrupted in late 1894 when Southern Commissioner Liu K'un-i was ordered north to take charge of the Chinese units defending Shan-hai-kuan against the Japanese. Governor General of the Hukwang Provinces Chang Chih-tung was named acting Liangkiang governor general and southern commissioner during Liu K'un-i's absence. Chang had served as governor general of the Hukwang Provinces since 1889. During these years, he had established a military-industrial complex consisting of an arsenal and an iron and steel works at Hanyang and coal mines in Hunan Province. ⑭ Because he had been unable to find secure sources of income to support all of these ventures, he had delayed the establishment of the arsenal and used funds designated as arsenal income to establish the iron and steel works. Even at that, by 1895 the latter institution, with no regular income of its own, faced a life-or-death financial crisis; and the arsenal, as a result of its extensive loans to the iron works, was over 600,000 taels in arrears to foreign creditors. During his temporary service in the Liangkiang Provinces, Chang retained control over these plants and mines. ⑮

In August 1895, he submitted to the imperial government a plan for reconstruction in the post-war period. In his discussion of military logistics, he pointed out the need for mass machine production of

⑬ *Eminent Chinese of the Ch'ing Period*, Arthur W. Hummel, ed., (Washington D. C. 1943-44) 855. *Ch'ing Shih* (History of the Ch'ing Dynasty), (Taipei: Kuo-fang yen-chiu-yuan, 8 Vols., 1961) VI 4843-44. *CCKT* III 77-9. *CWKTT* 28: 13.

⑭ *Eminent Chinese* 27-31, 523-4.

⑮ *DWHKTI* 39: 20-24. *CWHKKT* 12: 1-11, 14: 5-8. *CWHKTT* 4: 27b, 19: 11b-12a. *CWHKTI* 31: 25-30.

magazine rifles and quick-firing guns; and he stressed the point that arsenals should be located at secure inland sites on navigable waterways close to sources of raw materials. After presenting this description of where an arsenal should be and what it should produce so that it matched exactly the Hanyang Arsenal, Chang announced his intention to raise funds in the Liangkiang Provinces to alleviate the financial predicament of the Hanyang plant. ^⑩

On the same day, in a separate memorial dealing with reconstruction in the Liangkiang Provinces, he recommended that no further investment be made in either of the two arsenals in those provinces, Nanking and Kiangnan. The Kiangnan Arsenal, he observed, would require major investment in equipment for mass production of both magazine rifles and quick-firing guns. Such investment would be unwise, he reasoned, because of the arsenal's vulnerability. He noted that it could easily be subjected to naval attack. Moreover, the only route of egress from Kiangnan to a major waterway was through Wu-sung River into the Yangtze. If the mouth of the river were blockaded by hostile vessels, the distribution of munitions from Kiangnan would be virtually impossible.

In late September 1895, Chang submitted a proposal to the Board of Revenue asking authorization to use 600,000 taels from "southern maritime defense foreign loan funds" to liquidate the outstanding indebtedness of the Hanyang Arsenal. This transaction was eventually completed in 1896 when the Hanyang Arsenal received 626,000 taels from "southern maritime defense foreign loan funds." No repayment

^⑩ *CWHKTI* 37: 26-28.

was ever made. ⑰ It is clear that Chang was trying to discourage further investment in the Kiangnan Arsenal and divert the financial resources of the Liangkiang Provinces and/or southern maritime defense to the development of the newly established Hanyang Arsenal. In the latter respect he was notably successful. Although Chang did not bring up the subject of Kiangnan's annual customs income in his proposals to the throne, it soon became apparent that he had plans for these funds also--and that his plans were not unopposed.

During the fall of 1895, in what appears to have been a move to block Chang's access to Kiangnan's customs allotment, Arsenal Director Liu Ch'i-hsiang is reported to have engineered an edict which took control of Kiangnan from the southern commissioner and placed it directly under the Board of War with Liu confirmed in his post as arsenal director. Whereupon Chang, ignoring the obvious intent of the edict to recentralize control over Kiangnan's customs allotment, notified the Board of War that, since the arsenal was no longer a provincial institution, the provincial government would employ the million or so taels required annually to support arsenal operations (most of which came from the customs allotment) for improvements elsewhere in the Liangkiang Provinces. This would presumably free other financial resources for loans to the Hanyang Arsenal. However the imperial government, having no alternative source of income with which to

⑰ *CWHKTI* 38: 4-6, 11, 39: 20-24. *Hu-pei ping-kung kang-yao-ch'ang t'iao-shuo piao-tse* (Charts and explanations on the Hupei Arsenal), held by the Institute of History and Philology, Academia Sinica, Nankang, Taiwan, Republic of China. Sections cited here are "li-nien shou-chieh ke-k'uan ch'ing-tse" and "li-nien chi Hsuan-t'ung yuan-nien tsao-ch'eng shih-tsun ke-hsiang chun-huo piao-tse".

support operations at Kiangnan, did a sharp about face; in early December, another edict was issued confirmng Southern Commissioner Chang's control over the arsenal but also endorsing the appointment of Liu Ch'i-hsiang as director. ^⑮

The importance of these events as far as the future development of China's military industry was concerned seems to be twofold. First Chang Cih-tung had revealed his determination to change the center of military industry from Shanghai to Hanyang, There were sound strategic and economic reasons to support Chang' position and it would, of course, augment his personal power and prestige by placing under his control the only plants in China capable of producing modern ordnance. Secondly, Chang's confrontation with the imperial government was not simply a case of a recalcitrant provincial official successfully challenging a weak central authority's attempt to reextend its control over maritime customs income. Quite the contrary, the imperial government succeeded in directing the whole incident to serve its own purposes. It used its power of appointment to pit the entrenched power of the Liu Ch'i-hsiang administration against the growing ambition and assertiveness of Chang Chih-tung. If allowed free rein, Chang, no doubt, would have concentrated all resources for the production of modern ordnance at Hanyang thereby monopolizing logistical power within the empire and creating for himself a position of inordinate influence among the several governors general to whom the court looked for military-industrial leadership. To undermine Chang's plans, the imperial government merely gave its blessing to continued local control of the Kiangnan customs allotment and endorsed

^⑮ *NCH* Dec. 20, 1895; Jan. 17, 24, 1896. *CWHKTT* 28:11b.

the status quo at the arsenal. By so doing, it maintained the balance of military and political forces within the empire, But what effect did it have upon the operations of the Kiangnan Arsenal?

Chang immediately appointed commissioners, his own trusted followers, to make an inventory of arsenal property, to determine what missions Kiangnan was really capable of performing and to determine how expenses might be reduced. This step was very probably motivated by a desire to cut back operations and expenses at Kiangnan and thereby free funds from the Liangkiang Provinces for support of the Hanyang Arsenal. There is little doubt that Chang also intended this investigation to be an inquiry into the stewardship of Liu Ch'i-hsiang at the Kiangnan Arsenal.

On December 18, 1895, one of Chang's investigators wired him, outlining in concrete terms the accumulated defects in the arsenal's management. Favoritism had resulted in the hiring of excess official personnel. The numbers ran into the hundreds. The work force was packed with aging servants who were no longer able to work but nevertheless drew high salaries. The gunnery battalion had grown from one hundred to over six hundred. Sixty per cent of the customs allotment was consumed by personnel costs. The investigators recommended a complete personnel reorganization, elimination of the gunnery battalion and a careful inventory to check leakage. They noted that income from the sale of scrap was never reported; neither was income from the sale of translated books. On January 14, 1896, Southern Commissioner Chang ordered work at the arsenal to cease in order that the taking of inventory could proceed without interruption. By this time, Chang had suspended Liu Ch'i-hsiang and appointed a replacement as acting

director. ⑱

Chang Chih-tung's attempt to get at the root of the poor management at Kiangnan and to discredit Liu Ch'i-hsiang was frustrated when it was announced that Chang would soon be leaving the acting southern commissioner's post and that the substantive appointee, Liu K'un-i, would be returning. The investigation slowed down, and, after Liu resumed his post on February 24, 1896, Liu Ch'i-hsiang was reinstated as arsenal director. Although the investigation was continued by Liu K'un-i, the report finally submitted to the imperial government, in August, 1896, completely exonerated Arsenal Director Liu Ch'i-hsiang and even lauded his performance at the arsenal before and during the war.

This report was grossly misleading. It noted some minor discrepancies in reporting income from the sale of scrap and other miscellaneous sources and it outlined a plan for correcting these; but it never came to grips with the most important problems, the high costs of personnel and materiel. At the time that the report was submitted, the last year for which the arsenal's accounts were completed was 1890. When the figures for the years 1891 to 1895 were compiled, they would show that personnel costs increased by about 85,000 taels or 25% during these five years and they consumed a total of 36% of all expenditure; another 51% was devoted to purchasing.⑳ For the time being, these facts were obscured. The imperial government had again used its power of appointment - this time the reappointment of Liu K'un-i - to check Chang Chih-tung's ambitions with respect to the Kiangnan Arsenal. But, in so doing, it surrendered the arsenal to continued control by officials who allowed

⑱ NCH Jan. 24, 1896. *CWHKTT* 28:13. *CCKT* III, 76.

⑳ *Liu K'un-i i-chi* 25:922-25. *KNCTCC* 4:7-8.

inefficiency and corruption to rob Kiangnan of its resources.

The Commissionership of Liu K'un-i 1896-1902

During Liu K'un-i's post-war tenure as southern commissioner, which terminated with his death in 1902, very little progress was made toward the solution of the problems which had beset the arsenal in the prewar period. However, there was acknowledgment of these problems and the initial stirring of the reform spirit that would sweep the empire several years later. In the fall of 1897, Associate Grand Secretary and President of the Board of War Jung-lu submitted a memorial recommending that China's military industries be reoriented geographically. Arsenals, he said, should be established in the coal and iron producing regions of Shansi, Honan, Szechuan, and Hunan, rather than scattered along the coast as they were. He observed that, even though Kiangnan had its own steel refinery, the cost of refining was excessive because of the need to purchase both iron and coal from great distances. He went on to recommend that Kiangnan be moved to a location in Hunan Province close to the iron and steel mines recently opened there.

The Grand Council sent these recommendations to Southern Commissioner Liu and other concerned provincial officials along with an edict enjoining the provinces to give them careful consideration and, if local conditions permitted, to put them into effect. As far as the Kiangnan Arsenal was concerned, the outcome seemed certain. The imperial government's edict in the fall of 1895 had confirmed the southern commissioner's control over the arsenal and its rich customs income. Southern Commissioner Liu K'un-i's report of the investigation of Kiangnan's personnel and purchasing practices, submitted in 1896, had

shown that he had no intention of upsetting the status quo at the Shanghai plant. Furthermore the urgent demands placed upon Kiangnan in 1898 as authorities attempted to strengthen defenses in the Yangtze Valley subsequent to the German take over of Kiaochow Bay argued against any move which would disrupt current production.

Liu's reply to the edict on relocation was submitted in August 1898, after a study of the proposal had been made at Kiangnan. It completely squelched the idea of moving the arsenal. Ignoring the points which Chang Chih-tung had made in 1895, that the arsenal was vulnerable to both naval attack and blockade, Liu reasoned that Kiangnan's position in Shanghai was ideally suited to enable it to distribute munitions along the river and up and down the coast. Ignoring Jung-lu's point that production costs could be reduced by relocating Kiangnan near domestic coal and iron mines, Liu stressed the ease with which foreign materials could be purchased in Shanghai. Other reasons which he cited as militating against the move included: the recent expansion of steel refining and powder production; the difficulties and expense in disassembling and moving the arsenal machinery; and the good supply of skilled workers in Shanghai. Perhaps the most important reason of all for keeping Kiangnan in Shanghai was the unwillingness of local officials to see the arsenal's huge customs allotment leave the Liangkiang provinces. Liu implied that this was the case when he stated to the throne that it would be unwise to remove Kiangnan very far from the Shanghai Customs House. He warned that, if financial strain occurred in Shanghai, the customs allotment would be retained in that city, and Kiangnan, in its new location in Hunan, would be cut off from its source of income. Liu's memorial put an end to the discussion of

relocating Kiangnan for several years thereafter. ^{②①}

During these years Kiangnan's income increased rapidly. In the early 1890's overall annual income had varied between 600,000 and 900,000 taels. From 1899 through 1904, the annual figure fluctuated from 1,300,000 to nearly 1,500,000. The reasons for this increase were: first, the allotment from the Shanghai Customs House grew from around 800,000 taels per year in 1895, to more than 1,000,000 taels per year after the turn of the century, reflecting an abrupt increase in volume of trade at the port of Shanghai. Secondly, in 1896, after Southern Commissioner Liu reported that the new steel refinery and the two new powder plants had reached full production and that the arsenal was producing magazine rifles, quick-firing guns, and corresponding types of ammunition, Kiangnan was authorized an additional 200,000 taels income per year from customs houses and likin bureaus in the Liangkiang Provinces to support this production. Though this figure fluctuated widely from year to year, the annual average was close to 200,000 taels for the period 1901 through 1904. ^{②②} (See table I)

The decade following the Sino-Japanese War was not only a time of financial plenty for the Kiangnan Arsenal; these were years when the arsenal's income was also virtually immune from outside assessments—a situation which would change sharply in a few years time. For example, in 1898, during the wave of reaction that swept the imperial government following the abortive 100 Days Reform, a drive was launched to

^{②①} YWYT IV, 84-7. On the impact of the Kiaochow Bay incident at Kiangnan see *BPP* F. O. 405/77 No. 224.

^{②②} *KNCTCC* 4:8-10. Hosea B. Morse, *Trade and Administration of the Chinese Empire*, Shanghai: 1907), 243. YWYT IV, 152-4.

Table 1
Income of the Kiangnan Arsenal 1896-1904^{②③}

(Unit: Shanghai taels)

Year	Shanghai Maritime Customs	Liangkiang Customs and Likin	Miscellaneous: Scrap, Ship Repair, etc.	Total
1896	793,400	—	329,967	1,123,367
1897	812,251	60,000	37,678	909,929
1898	805,209	100,000	121,882	1,027,091
1899	923,162	220,000	236,789	1,379,951
1900	684,469	26,000	293,505	1,003,974
1901	1,069,388	195,000	191,783	1,455,171
1902	1,332,210	195,000	145,918	1,673,138
1903	1,196,312	170,000	150,752	1,517,059
1904	1,025,359	238,163	124,407	1,387,929

strengthen imperial finances. As a part of this an effort was made to tap the rich financial resources of the Kiangnan Arsenal. President of the Board of War, Associate Grand Secretary Kang-i toured the southern provinces beginning in the spring of 1899, for the purpose of increasing provincial contributions to the revenue of the central government. Though the provincial treasuries in the Liangkiang Provinces were among Kang-i's chief targets, the income of the Kiangnan Arsenal was carefully assayed but not heavily assessed. The crisis atmosphere created in the spring of 1899 by the Italian demand for a concession at Sanmen Bay in Chekiang may have worked to soften Kang-i's original demands. In any case, Kiangnan contributed only 12,000 tael of the total of 1,990,000 taels which Kang-i collected in the southern provinces. These funds were provided by selective and temporary reductions in personnel expenses.^{②④}

^{②③} KNCTCC 4:8-10.

^{②④} BPP, *Further Correspondence respecting the Affairs of China* (March 1900), No. 383, p. 350. YWYT IV, 155.

These abundant financial resources were steadily eroded by high personnel and materiel costs and inept management, problems inherited from the pre-war era. However, in the matter of freeing itself from dependency on highly paid foreign technicians, Kiangnan made considerable headway. This was an issue of national concern at the close of the war. In 1895, the perceptive Hu Yu-fen, who first recommended Yuan Shih-kai to head the reorganization of military forces in north China, also observed that China's arsenals had spent enormous sums on foreign advisors with virtually nothing to show for it while the technical training of domestic personnel had been almost entirely neglected. Kiangnan made its first move to respond to this criticism, in 1898, when the language institute and gunnery battalion were consolidated and organized into a technological institute. The four-year curriculum provided for specialization in either chemistry or machinery after completion of basic courses in Chinese, foreign languages, mathematics and drafting. Initially, the school was staffed with Chinese instructors but it was expected that foreigners also would eventually join the faculty. There were to be fifty students. Upon graduation, some would be at the disposal of the Tsungli-Yamen. The remainder would go on to teaching positions or be assigned to the Kiangnan or Nanking Arsenals. ²⁵

By 1899, Chinese were filling most of the key technical posts at Kiangnan and only two foreign engineers, both British, were on the arsenal's payroll. Their salaries, albeit, were inordinately high, about 1500 taels per month or 11% of the personnel budget excluding the salaries of Chinese official personnel. However, the problem of technical

²⁵ CCKT III, 9. YWYT IV, 88-90.

personnel development was far from solved at Kiangnan, or elsewhere in China for that matter. In the wave of self-criticism and reform that swept through the bureaucracy after the signing of the Boxer Protocol, the inspector general's office of the Peiyang Army issued a report observing that one of the reasons for the lack of progress and the waste of public funds at Kiangnan and other Arsenals in China was the policy of looking to domestic technological institutes for the development of technical personnel. The inspector general noted that the foreigners who were hired by such institutions were frequently of mediocre quality and that they did not always pass on all that they knew. The Chinese students selected for technical study were also not highly qualified. These conditions were reflected in the state of technical supervision at Kiangnan; it was reported, in 1902, that Chinese workmen making smokeless powder took a happy-go-lucky attitude toward their work and employed chemicals in varying quantities. The solution recommended was overseas study. ²⁶

In 1902, Southern Commissioner Liu also turned his attention to overseas study for Kiangnan technical personnel. Officials at the arsenal, impressed by the high technical capabilities of the many Japanese visitors whom they saw, reasoned that Japan had made such progress because she had sent students to western centers of technology for study while China had not. Now, in the opinion of Kiangnan's director, it was time for China to do the same. Since the cost of study in Europe or America was prohibitive, he asked Commissioner Liu to arrange through the Foreign Ministry and the Japanese arsenals for a party of Kiangnan

²⁶ *PYKTLT* 12:45. *BPP* Foreign Office, 405/124, No. 10 enclosure 1.

artisans to be sent to Japanese arsenals for training. Liu approved the arsenal's request and asked that the Foreign Ministry make the necessary arrangements. Although some students returned from Japan were employed at Kiangnan by 1906, the quality of the education which they received there is questionable. However, by this time authorities at Kiangnan were awaiting the return of more students from Europe and America²⁷.

Although Kiangnan had made an important beginning in reducing its dependence on highly-paid foreign technicians, the other side of the personnel problem, the overstaffing of useless domestic personnel, did not improve during Liu's administration as southern commissioner. It is quite certain, for example, that Hunanese officials continued to protect their own interests at the arsenal. A memorial temple for the distinguished Hunanese founder, Tseng Kuo-fan, was maintained on the arsenal grounds. Tseng's tablet was hung there and, on the anniversary of his death, memorial services were held and attended by all local officials. An inspection of personnel, in 1904, found that there were a number of officials at the arsenal who were not assigned to any of the plants. They had been hired through favoritism and had no regular duties. Their wage scale varied from ten to twenty taels per month; annually, they accounted for large sums of money totally wasted. The situation in the plants was the same; there it was found that many officials were simply drawing pay and occupying space. It was also discovered that some plants had personnel registered on the payrolls who had never taken up their duties. ²⁸

²⁷ *HFT* III, 309. *BPP* F. O., 371/41, F40892.

²⁸ *NCH*, Nov. 12, 1902. *YWYT* IV, 111.

In the post-war years, although Kiangnan was successful in partially eliminating its dependency on foreign suppliers, little progress was made toward reducing materiel costs. Domestic sources were found for some raw materials but there were still substantial transportation costs involved. By 1898, coal was being supplied from the T'ang-shan mines near Tientsin while iron ore for the steel refinery came chiefly from Hunan. With respect to steel products, the arsenal was largely self sufficient, however materials for powder production continued to come from abroad and during and after the Boxer Uprising, in 1900, imports were stopped and Kiangnan was forced to halt production. ②

The unavoidably high cost of materials was made even higher by continued malpractice in the field of purchasing. A report submitted to the Shanghai Taotai in the spring of 1903 by Arsenal Director Chao Pin-yen and released in the local press revealed that malpractice was widespread: arsenal officials accepted payments from suppliers; shipments were accepted and paid for at prices for specified qualities and quantities though the goods delivered were of lower quality and lesser quantity; and the arsenal was swindled at will by brokerage houses. These malpractices had involved the highest officials including former directors. One serious abuse was in the purchase of coal, probably the greatest single item consumed at Kiangnan. The price had varied from three to four taels per ton but the arsenal was billed at the rate of six or seven taels. ③ But the very fact that these matters were aired in the vernacular

② Charles Beresford, *The Breakup of China*, (New York and London: 1899), 296-7. *BPP* F. O., 405/86, No. 143, encl. 1; 405/98, No. 107, 126, 139, 179. *YWYT* IV, 85. *CWHKTT* 40:17.

③ *CCKT* III, 75.

newspapers was a sign of the growing public determination to do something to change them. The spirit of reform was overtaking Kiangnan.

The evils resulting from inept management also persisted at the arsenal. Aside from the overstaffing of useless personnel and purchasing malpractices which were clearly management responsibilities, the record shows that the arsenal management was financially irresponsible. For example, in early 1901, Director P'an Hsueh-tsu was removed from his post by Southern Commissioner Liu for cause. The next Director, Mao Ch'ing-fan, discovered that during P'an's brief tenure in the year 1900 the arsenal had accumulated debts totaling 750,000 taels. ③

The failure to make any significant degree of progress with the solution of these problems showed clearly in the arsenal's expense figures for the years 1896 through 1904 (See table 2). Personnel costs consumed 31% of all funds expended; 59% was devoted to the purchase of materials; another 0.5% was spent for munitions and translations, leaving only 9.5% for the modernization of production facilities. Even during these years of soaring income, the high costs of current production resulting from the costs of personnel and materiel and aggravated by management abuses robbed Kiangnan of the funds necessary for the modernization of equipment. The effect was clearly visible in the quality of the arsenal's production.

Taken by themselves the arsenal's production figures (See Table 3) seem quite impressive. Output, in some categories, was not small and there was a general trend of increase. However, an examination of

③ YWYT IV, 157.

contemporary evaluations of these products conveys quite a different impression. In ordnance production, for example, Kiangnan encountered insoluble problems with both the quality and quantity of its production. And, as difficult as these problems were, they were further complicated by the new requirement of coordinating the arsenal's production with that of the other plants in China.

Table 2
Expenditure of the Kiangnan Arsenal 1896-1904^②

(Unit: Shanghai taels)

Year	Wages, Salaries, Administration*	Purchase of Material	Purchase of Machinery	Munitions and Translation	Total
1896	285,357	695,069	115,630	3,002	1,099,058
1897	316,174	525,039	108,193	1,680	951,086
1898	354,683	766,950	35,197	1,556	1,158,386
1899	350,509	969,506	91,132	7,641	1,407,788
1900	421,566	776,904	245,894	1,849	1,446,213
1901	386,641	740,963	195,583	1,732	1,324,919
1902	389,069	714,225	18,223	5,097	1,132,614
1903	430,522	873,481	51,286	4,003	1,159,292
1904	450,728	402,207	39,779	2,559	895,373

* These figures include amounts spent for land purchase and building which, during these years, were insignificant.

During the 1890's, while Kiangnan was developing its magazine rifle, the Hanyang Arsenal was purchasing equipment and erecting facilities for the production of the 7.9mm Mauser magazine rifle. When the Hanyang plant began production in 1895, it became the second arsenal in China to produce western-style small arms. However, the Hanyang rifle was a different caliber from the one produced at Kiangnan and thus required different size ammunition. China's two largest arsenals had

② KNCTCC 4:8-10.

followed diverging paths in production and created a new roadblock to logistical cooperation and military unification.³³ The imperial government took the first step to remedy this situation in 1897, when tests were conducted at the capital to determine whether the Hanyang Mauser or the Kiangnan rifle was superior. These tests, conducted by foreign technicians, showed that the Kiangnan rifle was inferior in ten different respects, including the sights, the firing mechanism, the barrel--almost every major part.³⁴ The next step came in 1898. As part of the military reorganization which followed the 100 Days Reform, an edict was addressed to the provincial arsenals directing them to step up production and set standards for magazine rifles, quick-firing guns, cartridges, and

Table 3
Production of Arms, Ammunition and Steel at
the Kiangnan Arsenal 1896-1904³⁵

Year	Guns	Gun Ammunition (rds.)	Small Arms	small Arms Ammunition	Powder (lbs.)	Steel (lbs.)
1896	6	11,054	1,396	1,897,900	345,600	769,342
1897	19	12,140	1,481	3,075,060	243,168	4,538,240
1898	47	57,325	1,980	3,743,130	276,009	1,646,891
1899	62	65,453	1,820	5,407,750	217,330	1,485,547
1900	96	53,008	1,924	5,478,070	284,587	1,243,096
1901	78	55,480	1,962	5,105,200	167,371	853,691
1902	96	54,310	2,507	5,518,550	276,858	1,231,796
1903	43	56,872	3,067	6,159,170	207,161	3,459,284
1904	17	38,904	3,482	—	59,759	692,666

³³ *KNCTCC* 3:37-54, 10:18.

³⁴ *Hu-pei ping-kang-yao-ch'ang t'iao-shuo piao tse: ke-hsiang hsiang-hsi ch'ing-hsing*, 1. *NCH*, July 20, 1894, *CCKT* I, 543. *KNCTCC* 7:10.

³⁵ *CWHKKT* 15:29-34.

gun shells. Subsequently, another edict declared that since the Mauser was the best rifle, it should be produced by all arsenals. The provinces were directed to raise the necessary additional funds for production changes locally.

Southern Commissioner Liu replied that Kiangnan had already looked into the purchase of new machinery for rifle and gun production. The director had requested an additional allocation of 600,000 taels but, since this amount could not be raised, nothing was done. Now Liu reported that the twelve pounder and six pounder quick-firing guns produced at Kiangnan were the standard models employed in Peiyang. However, Kiangnan could not produce other standard models such as the 7cm quick-firing gun employed by Peiyang, the new 6cm model purchased by Nanyang, the 3.7cm quick-firing gun produced at Hanyang, nor the Hanyang Mauser rifle. Since new machinery was prohibitively expensive, he reported that the arsenal would buy additional parts and modify its existing gun machinery and the original Remington rifle machines to produce the desired models. The cost was set at 380,000 taels. ⑤⑥

In the Spring of 1899, Liu reported that the new parts for the rifle machinery had arrived and were being set up, but repeated modification of the old machines had impaired production capability. Output would be limited to ten rifles per day. The machinery was finally operative by early 1900, but it was not until the following year that production of the old Kiangnan magazine rifle was halted in favor of the 7.9mm Mauser. In 1902, the last several thousand of these rifles produced had to be scrapped when it was discovered that they were unsafe to fire. The

⑤⑥ *Ch'ing-ch'ao hsü wen-hsien t'ung-k'ao*, Liu Chin-tsao, ed., (Taipei: 1965), 9839-40.

following year a report on Kiangnan's production submitted to the throne revealed that the production of Mausers and quick-firing guns was seriously restricted by the slap-dash and incomplete state of equipment. Only seven of the partially hand-made Mausers could be turned out each day. ⑧

The same report stated the annual production quotas for the arsenal to supply the needs of the provinces of Nanyang and Peiyang. The annual requirement for magazine rifles was set at five thousand; 7.5cm quick-firing guns, two hundred; and large fort guns, ten to fifteen.⑨ The figures in Table 3 show that Kiangnan could produce only a small fraction of these quotas.

The Relocation Struggle 1903-05

The very fact that such a revealing report on Kiangnan's operations was forwarded to the throne by the southern commissioner was indicative of a profound change in the status quo in the Liangkiang Provinces. Such a change had indeed taken place on October 6, 1902 with the death of Southern Commissioner Liu K'un-i and the appointment, the following day, of Hukwang Governor General Chang Chih-tung, once again, as acting Liangkiang Governor General and Commissioner of Southern Ports. Actually there were signs of change at Kiangnan even before Liu's death. As the pendulum of Chinese politics swung back from the extreme of the Boxer Uprising and a willingness--even a determination--to update and improve the imperial system spread through the bureaucracy, Liangkiang officials were not immune from the contagion of reform. Liu

⑧ CCKT I, 298-99. YWYT IV, 143.

⑨ YWYT IV, 90-98.

K'un-i's support for the plan to send students to Japan, for example, signalled a sharp departure from the personnel development policies of previous decades. However it was Chang's appointment, at a time when anti-imperialist reform sentiment was sweeping China's official class, that set in motion forces which tore at the vested interests at Kiangnan and pitted Chang against other groups in the bureaucracy in a struggle for leadership in the reform of China's military industry.

Chang's unsettling presence was first felt in the areas of personnel and strategic planning. He moved promptly to break the power of the Hunanese clique and, at the same time, resurrected his plans to relocate Kiangnan in the Hukwang Provinces. His first appointment was to name Cheng Hsiao-hsu, a Fukienese official experienced in military production in Japan, to the post of director. Even before Cheng formally took office on February 3, 1903, he was in receipt of telegraphic instructions from Chang advising him that the rifles, small-bore guns and various types of ammunition made at Kiangnan were all defective and that production should be cut back to reduce costs. It was Chang's intention to reduce annual expenditure to between 400,000 and 500,000 taels and to set aside 120,000 taels per year toward the purchase of new equipment for a branch plant to be located in either Hunan or Hupeh. ³⁹

Cheng had hardly taken up his duties as director of Kiangnan when the imperial government transferred him to Szechuan to be in charge of mining and commercial affairs. Chang's appeal to stay this transfer was to no avail. However, his next appointee, Chao Pin-yen, an official from a Chekiang family who had served under Chang in Hunan, caused a

³⁹ *NCH*, Feb. 4, 1903. *CWHKTTS* 13:7-8. *CWHKTT* 65:1, 14.

tremor of fear to run through the Hunanese officials at Kiangnan. Chao had a reputation for strictness and it was widely rumored that he intended to clean out the Hunanese, who composed most of the arsenal's official staff.^⑩ It appears that their fears were well founded, for it was Chao who, in 1903, submitted the very damaging expose' of purchasing malpractices at Kiangnan which implicated many high officials, including former directors.

Chang's plans for the Kiangnan Arsenal were summed up in a memorial which he submitted jointly with Northern Commissioner Yüan Shih-k'ai on March 27, 1903. This was the document referred to above which revealed the serious deficiencies in Kiangnan's production. Chang, who was the principal author of the report, also brought up once more the problem of Kiangnan's strategic vulnerability and the desirability of relocating the arsenal at an inland site. Noting that foreign naval vessels now dominated the Huang-p'u River and the outlet into the Yangtze at Wu-sung, Chang cautioned that, in the event of hostilities, it would be an easy matter for one of the foreign powers to halt the distribution of arms from Kiangnan. Since the arsenal's production machinery was in such a sorry state, he reasoned that, instead of moving it inland at great expense and waste of immovable facilities, it would be better to establish a new plant with new machinery. He recommended a site at wan-chih in Anhwei Province about thirty miles by water from the Yangtze port of Wu-hu. There, bituminous coal could be supplied from nearby deposits under development by a Japanese firm and steel

^⑩ *CWTKTTS* 13:7-8, 12. *Ch'ieh-wan lao-jen ch'i-shih-sui tzu-hsü*, ed. Tang T'o, held by the Institute of Modern History, Academia Sinica, Nankang, Taiwan, Republic of China, 272-275. *NCH*, April 2, 1903.

could be purchased from the Hanyang Iron and Steel Works.

The estimated cost for new machinery and arsenal facilities to turn out 5,000 magazine rifles, 30,000,000 cartridges, 200 7.5cm quickfiring guns, ten 12 to 15cm fort guns, and appropriate amounts of gun ammunition each year was set at 5,000,000 taels. Chang forecast that this amount could be accumulated from the annual income of the Kiangnan Arsenal within a period of five years. He estimated regular annual income at 1,400,000 taels: 1,200,000 from the 20% of the Shanghai maritime customs and 200,000 from other customs and likin bureaus in the Liangkiang Provinces. More than 100,000 could be saved annually, he said, by discharging useless personnel and eliminating useless production. Another 100,000 per year could be saved by putting steamship repairs, steel sales, and munitions shipments on a business-like basis. Two hundred thousand taels annually would be set aside from the 20% fund and another 200,000 from the customs and likin bureaus. The remainder could be made up by using these funds to purchase pounds sterling and depositing them in interest-bearing accounts in the Hong Kong and Shanghai Banking Corporation.

For the present, he recommended that production of arms and ammunition at Kiangnan be cut back to about one-half of current levels in order to facilitate savings. Certain items such as smokeless powder, which cost over 300,000 taels per year, were to be eliminated entirely. After the fifth year, when the new plant was completed, the Shanghai facilities would be devoted to steamship repair, steel refining, and such non-military production as its machinery could accomplish, its products and services to be paid for by the recipients so that it would be wholly self-supporting. The customs allotment could then be completely devoted

to the support of production at the new plant.

In the same memorial, Chang brought up the related subject of weapons standardization. He proposed that, when the new machinery was purchased, a new and smaller bore diameter of about 6.5mm should be adopted for the magazine rifle. This was in keeping with the world-wide trend toward smaller bore diameters which offered greater range, force of impact, and fire power. Standardization would of course require new rifle machinery for the Hanyang Arsenal. This Chang also proposed. In the future, he advised, all commanders should be required to buy their rifles from Kiangnan or Hanyang. Standardization would thereby be insured and both arsenals would be assured a continuing demand for their small arms. ④

Several days before submitting this memorial, Chang left his post as acting southern commissioner Liangkiang governor general for a temporary appointment in the capital. His replacement was Wei Kuang-tao, scion of the distinguished Hunan family of Wei Yuan, who was well known for his clannishness and the retinue of Hunanese hangers-on who accompanied him wherever he went. Wei showed himself to be ill-disposed to the expose' which Chang and his appointee Director Chao Pin-yen, were conducting at Kiangnan. In early August 1903, he summoned Arsenal Proctor Li Chung-ch'io to Nanking and discussed with him the changes which Chao was making at the arsenal. Not long after Li's return to Shanghai, Chao recognized the futility of his position and resigned. ⑤

④ YWYT IV, 90-98.

⑤ *Chin-tai Chung-kuo shih-shih jih-chih*, Kuo Ting-yee, ed., (Taipei: 1963) 1171, 1175. Hummel 851. BPP F. O., 405/134, No. 30. Tang T'o 272-275.

During the summer of 1903, while Chang's memorial was pending in Peking, it became apparent that Wei did not support Chang's plan to cut back operations in Shanghai in order to effect savings to finance re-establishment elsewhere. Word reached Chang that Wei had ordered new machinery and was planning an expansion of the Shanghai plant. In mid-August, 1903, he wrote to Chang that his intention was to establish only a rifle plant at Wan-chih. Chang replied angrily that he knew that his proposals were going to receive imperial approval and that Wei's actions were completely inconsistent with them. He revealed that he and Wei had previously reached an understanding regarding the re-establishment in Wan-chih and bitterly accused Wei of renegeing. In an effort to maintain his control over operations at Kiangnan, Chang demanded that the official appointed to succeed Chao Pin-yen be of his own choosing. ^{④⑨}

It was late in August, 1903, when the edict approving Chang's plan for re-establishment at Wan-chih reached Southern Commissioner Wei Kuang-tao at his headquarters in Nanking. The edict directed the southern commissioner to implement the re-establishment plan in collaboration with Chang Chih-tung and it enjoined Chang to keep the imperial government advised of the progress progress being made. However, it was now clear to Chang that, since Southern Commissioner Wei did not support his re-establishment plan, success or failure would depend to an important degree on the director of Kiangnan, the official who would actually be carrying out the austerity program and production cutbacks in Shanghai. Chang was successful in vetoing Wei's proposal

^{④⑨} CWHKTT 67:2-4.

to appoint Mao Ch'ing-fan, a previous director who was opposed to re-establishment, to replace Chao. Instead, Chang's nominee, Shen Pang-hsien, was appointed. ④

However, Chang's victory proved to be an empty one. The troubled international situation in East Asia in 1903-04 resulted in heavy demands for current production. In early 1904, Shen reported the arsenal could not meet the savings schedule which Chang had laid out. At most, they could accumulate 500,000 taels per year. At this rate, Shen advised, it would take ten rather than five years to amass the capital necessary for re-establishment. ⑤

When Chang heard of the financial difficulties which his plan was encountering he had already left Peking and was enroute to resume his post as governor general of the Hukwang Provinces. There followed several months in early 1904 during which he reformulated his plans for the Kiangnan Arsenal. His objectives were unchanged since 1895; he still wanted to divert Kiangnan's huge customs allotment to the establishment and support of a new arms plant at a safe inland site, nearer to domestic sources of raw materials and under his own control.

Though Chang had proposed the first plan for re-establishing Kiangnan in Anhwei, the final selection of that site probably reflected the preferences of the plans co-sponsor Northern Commissioner Yüan Shih-k'ai. Chang himself had originally favored either Hunan or Hupeh. In reformulating a proposal for re-establishment, Chang made the location his first consideration. In mid-May, 1904, he wrote to the director of the

④ YWYT IV, 98-100. CWHKSC 7:1. CWHKTT 67:4. NCH, Dec. 11, 1903.

⑤ CWHKTT 68:13.

Hanyang Iron and Steel Works to investigate a site near the city of P'in-ghsiang in Kiangsi close to the border of Hunan. Several days later, he wrote to the governors of Hunan and Hupeh that P'ing-hsiang had been selected as the new site for Kiangnan. Forseeing that financial difficulties would probably delay the actual establishment, Chang advised the governors that in the future Kiangnan could probably be established in Hunan in accordance with the wishes of Hunan officials.^⑥ Actually, the Ping-hsiang site was strategically subordinate to Hunan rather than Kiangsi Province, for the only route of entry and exit was by rail to Chu-chou on the Hsiang River in Hunan and thence by water to the Yangtze. Economically, it could not fail to benefit the Hukwang Provinces, for Kiangnan, at this new site, would surely become the leading customer of the P'ing-hsiang coal mines owned by Sheng Hsuan-huai, director of the stock company which owned the Hanyang Iron and Steel Works.^⑦

In a meeting with Liangkiang Governor General Wei Kuang-tao at Wu-hu in early May, Chang won him over to the new plan for relocating Kiangnan at P'ing-hsiang. In early June, 1904, they submitted their revised proposals in a joint memorial. This extremely long and detailed document restated much of the rationale which Chang had used a year earlier to support his proposal to move Kiangnan to Anhwei. The memorialists explained that the failure of the arsenal to meet the savings program of the first plan was due to the increased demands for production occasioned by the unsettled international conditions in East Asia. To

^⑥ *CWHKTT* 68:19, 24.

^⑦ *BPP, Further Correspondence respecting the Affairs of China*, (Oct.-Dec., 1904) 87; (Jan.-March, 1905) 35. *NCH* May 13, 1904.

remedy this situation, a new financial plan was devised under which Kiangnan would be expected to accumulate 700,000 instead of 1,000,000 taels each year. Wei agreed to provide another 300,000 taels annually from provincial treasuries of the Liangkiang provinces. Over a period of five years this would make up the required 5,000,000 taels set in the first plan.

However, the move to P'ing-hsiang would entail considerably greater expense. Because of the remoteness of P'ing-hsiang from both Kiangnan and the Hanyang Steel Works, and because iron mines were expected to open there very shortly, it was decided that the new plant should include refineries capable of producing Siemens Martin and crucible steel so as to take advantage of the nearby source of ore. In addition, transportation costs for moving equipment into the new site would be considerably higher and some machines which originally were to be moved from Shanghai, under the new Plan were replaced by new purchases. The overall figure for establishment at P'ing-hsiang rose from 5,000,000 to 6,500,000 taels.

To cover the inadequacies of the old financial plan and the additional requirements of the new one, Chang and Wei proposed to establish a mint at Kiangnan for the production of copper dollars. The profits from this enterprise were to be divided equally between the old plant and the new one. After five years, when the new plant was completed, one-half of the income from the mint would be retained by the old plant to augment its income from the sale of products and services. The other half of the profits from the mint plus the entire maritime customs allotment and the 200,000 taels supplied annually from customs and likin bureaus of the Liangkiang Provinces would constitute the annual income of the

new Kiangnan Arsenal.

Whereas Chang's first plan for removal of Kiangnan to Anhwei seems to have represented a compromise of his own interests with those of Northern Commissioner Yüan Shih-k'ai, this second plan ignored the interests of peiyang but incorporated new features clearly designed to make it more acceptable to Liangkiang provincial interests. First, Shanghai was to be provided with a new local source of income, the mint. Secondly, one of the basic assumptions of the first plan was that operations of the Shanghai plant would be cut back drastically in order to accomplish the financial plan for establishment of the new plant. This had been the main point of disagreement between Chang and Wei and the reason for the failure of the first plan. Under the new plan, it was specified the Shanghai plant would be reorganized and that useless production would be eliminated. But it was also clearly stated that the old plant would continue to produce Mauser magazine rifles, 7.5cm quick-firing guns, 15cm fort guns, the ammunition for these weapons, and other types of ammunition required for ordnance then held by Chinese military units. Smokeless powder production was to be continued if quality could be improved. Steel production and ship repair were not to be affected and the machinery repair shop was to be enlarged in anticipation of the day when the arsenal would be making non-military products for sale. For the time being, then, the only important cutbacks at the Shanghai plant would be in areas where production was outmoded or of substandard quality.

Finally, the way in which the new plan would be implemented would, in the last analysis, depend on the personnel who were carrying it out. The first plan had been attempted under directors Chao Pin-yen and

Shen Pang-hsien, both of whom shared Chang Chih-tung's view that the Shanghai plant was of very little value. Under the new plan, Wei Yun-kung was appointed in charge of the operations at the Shanghai plant and planning for the P'inghsiang site. Since he was a relative of Southern Commissioner Wei and his personal choice for the job, it could be expected that, as changes took place at Kiangnan, the desires of the southern commissioner would be given paramount consideration. ④

By the middle of June, 1904, Wei Yun-kung had taken up his post as director of Kiangnan in Shanghai and in charge of planning for the new plant in P'ing-hsiang. His instructions from Governor General Wei told him to thoroughly reorganize the operations in Shanghai, to consolidate production, economize, and set aside the funds required by the financial plan. He was also told to move ahead with the establishment of the mint to be sure that profits from this undertaking could be used to make up any financial deficiencies.

Wei's first report as director was submitted to Governor General Wei in mid-summer, 1904. This was the 1904 report referred to previously which noted the excessive numbers of idle officials on the Kiangnan payroll. Director Wei also pointed out the laxity in purchasing procedures and the lack of security over arsenal property, which resulted in leakage and theft. He announced his intention to re-establish the purchasing office, which had been eliminated by Director Liu Ch'i-hsiang in the early 1890's, and the guard force, which had recently been done away with by Director Chao Pin-yen. On the question of cutbacks in production, Director Wei was very vague. With the exception of brown and black

④ YWYT IV, 100-11.

powder, which he decided to stop producing because of the large quantities in reserve, he did not indicate that he was planning to cut back in any other area of production. The various plants were so interdependent, he observed, that production could not be halted in any one without affecting the operations of the others. In order to get the mint established as quickly as possible, Wei reported that he was going to convert the gun ammunition plant for minting and distribute the various operations of gun ammunition production among several other plans. Since customs proceeds were declining, the need for the mint was urgent. Accordingly, Wei asked that he be authorized to use 520,000 taels deposited in the Shanghai and Hong Kong Banking Corporation and earmarked for the new plant to purchase the required machinery for the mint.

With such a conservative attitude toward cutting back the operations of the Shanghai plant, it was inevitable that the new financial plan would encounter difficulties. Indeed, Wei reported that the plan was already in serious trouble. Customs income had declined from an average of about 90,000 taels each month during 1902 and 1903, to about 69,000 taels per month during the first quarter of 1904. Unless customs proceeds increased sharply during the remainder of 1904, income from that source would be only 800,000 to 900,000 taels instead of the 1,100,000 to 1,200,000 upon which the plan was predicated. Adding to this the 200,000 taels from Liangkiang customs and likin bureaus, the total income for 1904 would be only 1,000,000 to 1,100,000. Seven hundred thousand taels of this had to be set aside for the new plant and another 360,000 taels were required for irreducible salaries, administrative costs and school expenses. Expenses were greater than income without even figuring the

major outlays required for the purchase of materials.

Director Wei was clearly in an impossible position. Though he was under instruction to make savings in accordance with the financial plan for the P'ing-hsiang plant, he had also received explicit instructions from Southern Commissioner Wei to maintain the Shanghai plant without extensive cutbacks. There would be no income from mining for more than a year and current income was declining. As a temporary solution, he appealed to the southern commissioner to allocate to the arsenal certain steamship funds which were deducted from the 20% of customs proceeds before the arsenal ever received it, and other funds still due Kiangnan from the customs allotment of 1898. He asked that Commissioner Wei approve all expenditures for production requested by other provinces and that the arsenal be authorized to borrow the funds required for deposits on machinery to be ordered for the new plant.^④

Southern Commissioner Wei's reply cut off most of these possibilities for financial relief. He agreed to order the customs to forward funds due the arsenal from 1898 and to approve all requests for the arsenal to expend funds for production. However, he directed that the funds in the Hong Kong and Shanghai Banking Corporation should not be withdrawn since they were accumulating interest and he declined to grant the arsenal the steamship funds which it had requested. The placing of deposits for machinery for the new plant, he said, could be delayed. ^⑤

Under these circumstances, it seemed inevitable that the accumulation

^④ YWYT IV, 111, 111-16.

^⑤ YWYT IV, 117-18.

of the re-establishment fund would have to be curtailed in order to meet current expenses. Southern Commissioner Wei obviously preferred this alternative to making serious cutbacks in production and disrupting the status quo at Kiangnan. It seems that he backed the re-establishment plan primarily for what he thought the Liangkiang Provinces could gain from it, i.e., the mint and the improvement of production at Kiangnan. When it came to making financial sacrifices or enforcing economy in his own bailiwick, he was no longer interested. Chang Chih-tung certainly knew this to be the case, for it was soon revealed to him that the Liangkiang Provinces were not forwarding the annual allotment of 300,000 taels to the P'ing-hsiang establishment funds, as Wei has agreed that they would. ^⑤

At this point, in the summer of 1904, when Southern Commissioner Wei appeared to be on the brink of undermining Chang Chih-tung's second plan for the re-establishment of Kiangnan, the imperial government injected itself into the struggle between the two governors general. There were several motivating factors here. First, officials of the imperial government were apparently perplexed by the facile way in which Chang's second memorial, of June 1904, had dismissed the first site chosen for re-establishment as unsuitable and substituted in its place the new site at P'ing-hsiang. More importantly, the newly formed Military Reorganization Commission of the Board of War was badly in need of funds to finance its planned reorganization of China's armed forces. To supply this need, the central government hoped to mobilize the rich financial resources of the Yangtze provinces. The reassertion of imperial control

^⑤ CWHKTT 72:10.

over Kiangnan's huge customs income would be a major step in this direction. Finally, Northern Commissioner Yüan Shih-k'ai, who served as an Assistant Commissioner of the Military Reorganization Commission, was opposed to the P'ing-hsiang site. He favored re-establishment in the North China province of Honan.⁶²

The imperial government made no response to Chang's second re-establishment plan. Instead, on July 17, 1904, an edict directed T'ieh-liang, the Manchu Vice President of the Board of War and an Assistant Commissioner of the Military Reorganization Commission, to inspect the troops and finances of the Liangkiang and Hukwang Provinces and to investigate and report on possible sites for removal of the Kiangnan Arsenal. It was perfectly clear to all concerned that there was another unstated objective for his mission: he was to collect provincial funds for the government's planned military reorganization. ⁶³

T'ieh-liang, in the company of his German advisor, Heckman, inspected the Kiangnan Arsenal during early September 1904. He apparently left no stone unturned, examining every item of income and expenditure, funds on hand, products, personnel, and purchasing. His vigorous inspection of finances forced officials to withdraw the government funds which they had let out at high interest rates to native banks and pawn shops in Shanghai with a resultant tightening of the money market and doubling of interest rates. After determining the arsenal's assets at 804,980 taels, of which 500,000 were designated for the new plant, T'ieh-liang froze these funds and instructed Director Wei to vigorously reorganize the Shanghai plant pending an edict which would set forth

⁶² NCH, Oct. 21, 1904. *CWHKTT* 69:21-22.

what was to be done about re-establishment. Due to the resentment which T'ieh-liang's inspections stirred up among local officials, his orders were revised. on November 29, 1904, he was directed to devote of remainder of his tours to an inspection of the possible sites for relocation of the Kiangnan Arsenal. ⑤④

Meanwhile, during the autumn of 1904, the situation at Kiangnan changed considerably. On September 1, when T'ieh-liang's inspection was about to begin, the imperial government cleared the way for establishing its own control over Kiangnan. Wei Kuang-tao was transferred from his post as Liangkiang Governor General amid a flurry of annoyed comment from Chinese and foreign circles over the brief duration of his stay. Wei was replaced by another Hunanese, Li Hsing-jui. Li had a long background of experience at Kiangnan which showed him to be an able and reform-minded official. However, he served as acting Liangkiang Governor General for only two months before his death on October 31, 1904. ⑤⑤

Li was replaced by the former Shantung Governor Chou Fu. Chou, a former protege of Li Hung-chang, had served as Governor of Shantung from 1902 until 1904, during the period when Northern Commissioner Yuan Shih-k'ai was establishing the new Peiyang Arsenal at Te-chou in that province. ⑤⑥ It could be expected, then, that Chou could cooperate with Yüan and would accept the guidance of the Military Reorganization Commission, where Yüan functioned as an assistant commissioner.

⑤③ YWYT IV, 158-9. NCH, Sept. 2, 1904. BPP F. O., 405/154, No. 38.

⑤④ YWYT IV, 158-62. NCH, Sept. 2, 1904. BPP F. O., 405/154, NO. 38.

⑤⑤ Kuo Ting-yee, 1211, 1214. YWYT IV, 170-5.

⑤⑥ Wang Erh-min, *Ch'ing-chi ping-kung-yeh te hsing-ch'i*, (Nankang, 1963), 87-8. Hummel 471.

Indeed, after Chou Fu took office as southern commissioner, Yüan was routinely consulted on all major decisions regarding the Kiangnan Arsenal.

Chou's first step was to dissociate the proposed mint from the arsenal. He saw the whole idea of the mint for what it was: a rather unrealistically conceived scheme which had been injected into the re-establishment plan in order to win over the Liangkiang authorities by promising the creation of a new source of income. Chou reasoned that it was unwise to divert Kiangnan's facilities away from production currently required for the conduct of defense. He pointed out that another mint, in addition to the one already established in Nanking, would only increase the possibilities for variations in metallic content and confusion in the currency. For these reasons, he directed that the initial increment of machinery which Wei Yun-kung had already ordered should be consolidated into the Nanking Mint. If and when profits were derived from this venture, Chou instructed that they should be used to pay the balance due on the cost of the minting machinery. When a final decision on re-establishing Kiangnan was reached, if mint profits were available, they would be used as directed. ⑤7

T'ieh-liang submitted the report of his inspection of the Kiangnan Arsenal to the imperial government in February, 1905. This document substantiated the charges of inefficiency, malpractice, and mismanagement included in the original memorial by Chang Chih-tung and Yüan Shih-k'ai. He found that production equipment was a hodgepodge of new and old. Artisans were untrained and the director and other officials did not

⑤7 YWYT IV, 121.

understand what was going on at the arsenal. The arsenal had no system of quality control and many of the finished products were unfit for use. Funds were wasted on excessive official personnel, purchasing malpractices, and extravagant use of materials in the shops.

Between the two sites, Wan-chih in Anhwei and P'ing-hsiang in Kiangsi, T'ieh-liang preferred the latter. He found the transport conditions at Wan-chih so difficult that one cannot help but wonder how Chang and Yüan could ever have agreed on this site in the first place. T'ieh-liang's recommendations for the future location of the Kiangnan Arsenal were part of a scheme for the development of military industries throughout China. Under this scheme, construction of the P'ing-hsiang plant would be delayed and a new plant would be built at a location north of the Yangtze—so situated that it could ship munitions to the provinces of both North and South China. The funds for establishment of the plant would amount to about 650,000 taels and would be provided in accordance with the five-year fund-raising plan which Chang Chih-tung had proposed for the P'ing-hsiang plant. Director of this plant would be entrusted to a specially appointed official and it would be subject to periodic inspection by the Military Reorganization Commission.

T'ieh-liang's proposals also foresaw that the Shanghai plant would continue to have an annual income of about 1,000,000 taels from customs and future mint profits. He recommended a thorough reorganization to eliminate waste and then, specialization on ammunition production, steel refining, and ship repair. T'ieh-liang also commented on the standardization of rifle bore diameters at a smaller caliber. Though the northern and southern commissioners had both supported Chang Chih-tung's proposal of 6.5cm, T'ieh-liang felt that such a reduction in size would

seriously lessen killing power. He wanted the whole matter of rifle and gun bore diameter standardization submitted to the Military Reorganization Commission. ⑤⑥

When Chang Chih-tung heard of T'ieh-liang's proposals, he wrote to him, counseling against the plan, which would shift the Kiangnan customs allotment from the P'ing-hsiang plant to a North China plant. Such a plant, Chang advised, would not be able to adequately supply South China, and the Hanyang Arsenal could not shoulder that burden alone.⑤⑦

A memorial in response to T'ieh-liang's proposals was submitted jointly by the Military Reorganization Commission and the Bureau of Government Affairs. Their plan incorporated the decisive point in T'ieh-liang's proposal, the diversion of Kiangnan's customs allotment to the establishment of an arsenal in North China rather than at P'ing-hsiang. Additional funds for the North China plant were to be provided by allocations from the provinces of Chihli, Shantung, Honan, Shansi, Shensi, Fengtien, and Kirin. In a very transparent attempt to mollify Chang chih-tung, this plan also called for the establishment of a new plant at P'ing-hsiang. This arsenal was to be financed by the 300,000 taels per year which the Liangkiang Provinces had agreed to—but were not—forwarding to the re-establishment funds, future profits from the new minting facilities at Nanking—if and when these materialized—and contributions from Chekiang, Szechuan, and the Hukwang Provinces.

This plan also laid the ground work for the assumption of control over the new provincial arsenals by the Military Reorganization Commission. A method for designating directors of the northern and

⑤⑥ YWYT IV, 176-82.

⑤⑦ CWHKTT 71:23-24.

southern plants was adopted, the terms of which provided for recommendation by the northern and southern commissioners, final selection by the Military Reorganization Commission, and appointed by the throne.

As for the Kiangnan Arsenal, it was optimistically forecast that half of the customs allotment plus future profits from minting would provide an annual income close to 1,000,000 taels during the next five years. The Shanghai plant was to reorganize completely and streamline operations so as to emphasize ammunition production, steel refining and ship repair. After the completion of the new plants, other operations at Kiangnan would be merged with them. This plan also recommended that jurisdiction over the matter of bore diameter reduction and standardization be given to the Military Reorganization Commission.^⑩

These proposals, which would bring funds and military production power from Shanghai to North China where they would be under the control of the Military Reorganization Commission and at the service of the new armies headed by Yüan Shih-k'ai, clearly represented the coincident interests of these two parties. Predictably, they received swift imperial approval. Chang Chih-tung's reaction was also predictable, immediate and altogether dissentient. As soon as he heard that the Kiangnan customs allotment was to be used for an arsenal in North China, he wired Kiangnan Director Wei that he would have nothing more to do with the establishment at P'ing-hsiang. ^⑪

Within one decade the power relationship between the Yangtze governors general and the imperial government with respect to control of the Kiangnan Arsenal had changed 180 degrees. The new element in

^⑩ *CCKT* III, 52-4.

^⑪ *CWHKTT* 72:10.

the balance of power seems to have been Northern Commissioner Yüan Shih-k'ai. The year 1895 found China badly beaten, the power of Peiyang crushed, and Northern Commissioner Li discredited. The Yangtze Provinces, on the other hand, had not been deeply involved in the war and they had emerged virtually unscathed. Under these circumstances, the court had no alternative but to look to the Yangtze governors general for leadership in the reconstruction period. Nevertheless, from its position of weakness, the imperial government had been able to squelch Chang Chih-tung's hopes to gain control of Kiangnan's customs income by pitting the entrenched power of the Hunanese administration headed by Liu K'un-i against Chang. But this mode of leadership-playing one provincial regime off against another--had also cancelled out all hopes of meaningful reform at Kiangnan for the next few years.

Now, in 1905, the situation was entirely changed. In the intervening years under the able leadership of Yüan Shih-k'ai, the military power of North China had re-emerged as the foremost in the Empire. With respect to the Kiangnan Arsenal, Yuan's interests and those of the imperial government were very close. Both wished to direct the huge income and great productive capacity of Kiangnan to North China. The Military Reorganization Commission, the organ through which the Board of War hoped to extend its control over military affairs in the provinces, provided the administrative framework in which these interests could coalesce. The throne prepared the way by appointing Chou Fu, a follower of Yuan's, to the post of southern commissioner. Once the commission, armed with the authority of Yuan Shih-k'ai's membership, decided to reassert central control over Kiangnan, Chang Chih-tung could not but acquiesce.

Reorganization During the Savings Program 1905-1911

No sooner had the Military Reorganization Commission succeeded in diverting half of Kiangnan's income to the establishment of a centrally controlled arsenal in north China than problems appeared at the Shanghai plant which made it seem doubtful that this amount could actually be accumulated each year. In 1905, Southern Commissioner Chou Fu, who was determined to save the 700,000 taels annually, inquired of the arsenal as to the exact status of the 60,000 taels per month which they should be setting aside in order to accumulate this total. Director Wei's reply revealed that part of the 480,000 taels accumulated during the last eight months of 1904 had been frozen by T'ieh-liang's orders and that the rest had either been spent for, or committed to, expenses related to minting. As Wei pointed out, this meant the arsenal had no reserve funds and, in months when the customs proceeds dropped sharply, the deduction of 60,000 taels constituted a serious hardship. He appealed to Chou to set the deduction at one-half of the monthly allotment from the customs house rather than a fixed sum. The circumstances being what they were, Chou agreed and he assured the arsenal that the 490,000 taels expenses incurred for minting would be repaid with interest by the Nanking Mint.^② It is unclear just how long this system of deducting half the monthly allotment stayed in effect, but by the end of 1906, the arsenal was back on a savings program of 60,000 taels per month during ten months of the year and 50,000 taels during the remaining two.

Shortly after Chou Fu took over the reins of government in the

② YWYT IV, 165-8.

Liangkiang Provinces, He and Yuan Shih-k'ai worked out a plan to streamline operations and reduce expenses at Kiangnan in order to facilitate accomplishment of the savings program and, at the same time, capture the lucrative ship repair trade of Shanghai which was monopolized by the British firm. Farnham Boyd and Company. In January, 1905, Chou and Yuan proposed a scheme for naval reorganization under which the ships of the Southern Commissioner and naval-related institutions in Nanyang such as the Kiangnan Shipyard would be placed under the control of the commander of the Peiyang Fleet, the British educated Admiral Yeh Tsu-kuei. By the end of March, 1905, Chou made a specific proposal on how this would be done. The Kiangnan Yard was to be subordinate to Admiral Yeh, head of the reorganized Navy. The director would be Captain Wu Ying-k'e, while the German technician Basse would be in charge of engineering assisted by Mr. R. B. Mauchan formerly the senior boiler maker with Farnham Boyd and Company and other foreign staff totaling fourteen. Management was to be on a commercial basis; military vessels would be repaired at cost but a profit would be charged for work done on commercial ships. ⑧

This scheme was put into effect in the summer of 1905. The steamship plant, the machine shop, the boiler shop, the wrought iron shop, the carpentry shop and the iron foundry all were detached from the arsenal and, together with the drydock, these constituted the new Kiangnan Shipyard. Initial capital amounting to 200,000 taels was borrowed from the Liangkiang Grain Intendant with the understanding that it would be repaid from the profits on commercial repair jobs. The

⑧ Chou Fu, *Chou Ch'ueh-shen kung ch'üan-chi* (The complete works of Chou Fu), memorial dated Kuang-hsu 31/12/13. *YWYT* IV, 121, *NCH* May 19, 1905.

shipyard was subordinated to the navy while the arsenal came under army control. ⁶⁴

The Kiangnan Shipyard seems to have been a modest success right from the very beginning. So much so, in fact, that Farnham Boyd and Company, in early 1906, contacted Chou Fu, Yuan Shih-k'ai and the British Legation requesting enforcement of an agreement which they alleged had been concluded between Chinese authorities and the consular body prohibiting the Chinese government from operating a commercial shipyard in Shanghai. Farnham Boyd complained that they were losing work and that Kiangnan had hired away their best foreman at a wage they could not afford to pay. Both Yuan Shih-k'ai and Chou Fu as well as the British Foreign Office dismissed the British company's allegation of an agreement as groundless.⁶⁵ Nevertheless, the Kiangnan Shipyard continued the focal point of sino-foreign imbroglio. In October 1906, the vernacular press in Shanghai, perhaps overly sensitive to the sharp increase in foreign influence at the shipyard during the past year, charged that the first year of operation had resulted in a loss of 300,000 taels and that all authority was in the hands of Basse and his assistants who, they alleged, padded the costs on jobs for the Chinese government using the profit to hold down costs on the repair of foreign vessels. Though these charges were probably exaggerated in view of the favorable report on shipyard operations made by an American-educated Chinese engineer who held an inspection of the yard in late 1906, they reflect a keen awareness of the increased foreign presence at Kiangnan on the part of the local pressmen—an awareness that was, no doubt, stimulated

⁶⁴ *YWYT* IV, 122-3. *HFT* III, 385-6. *YWYT* VIII, 500.

⁶⁵ *BPP* F. O., 371/32, 11936.

by the contrast with Kiangnan's previous record in minimizing reliance on foreign technicians. ⑥

Although the conditions under which the Kiangnan Arsenal and the new shipyard were to exist side by side and share certain facilities were carefully spelled out in the regulations establishing the shipyard as a separate entity, it was not long before the relationship was complicated by official jealousies. Disputes over the ownership and use of materiel and facilities first reported in the summer of 1905 persisted for more than a year. Cooperation between the two institutions seems to have been impeded by the unyielding attitude of Mr. Basse. After Basse's departure from the yard and the appointment, in late 1906, of Taotai Chang Shih-heng of the Military Reorganization Commission as arsenal director with general supervisory authority over the shipyard, there are no further indications of friction. Furthermore in the next five years, 1906-1911, the yard was swamped with work. Eighteen major vessels were completed for the Chinese government and Chinese and foreign shipping firms, ranging in size up to 4,000 tons displacement (See Table 4). Although foreigners continued to play essential roles in production, ones which could not be supplied by Chinese technicians, the local press chided the arsenal director to define carefully the limits of their authority. On balance, it seems that the Shipyard was a effective and financially independent institution. ⑦

Perhaps it was because of this impressive performance, that foreign interests sought to gain control and, in fact, came within a hairs breadth of doing so. In 1908, Commander I. V. Gillis U. S. N (Ret.) arrived in

⑥ *NCH*, Sept. 1, 1905; Oct. 16, 19, 1906; Jan. 11, 1907. *CCKT* III, 97-8.

⑦ *NCH*, Sept. 1, 1905; Oct. 16, 1906. *PYKTLTHP* 1607. *CCKT* III, 97-8. *HFT* III, 451-2.

Table 4*
Vessels Completed at the Kiangnan Shipyard 1906-1911 ⑧

Year	Name	Ordering Unit	Type	Length (ft.)	Width (ft.)	Depth (ft.)	Displacement (tons)	Horse- power	Draft
1906		China Merchant Co.	Steel Tug	115	21	10			
1906		China Merchant Co.	Steel lighter	185	35	10			
1906		China Merchant Co.	Steel Lighter	160	30	10			
1906		China Merchant Co.	Steel Lighter	160	30	10			
1907		Hui-te Foreign Firm	Steel Lighter	115	27	9.6			
1907	Feng-t'ien	Li-ho Foreign Firm	Patrol Boat	106.6	20	8.6			
1907	Feng-f'ien	Li-ho Foreign Firm	Patrol Boat	106.6	20	8.6			
1907	P'ing-fu	P'ing-hsiang Coal Mine Bureau	Steel Tug	115	21	9	180	550	5.9
1907	P'ing-shou	P'ing-hsiang Coal Mine Bureau	Steel Tug	115	21	9	180	550	5.9
1908	Kan-ch'uan	Ministry of Navy	Gunboat	119	20	10	305	300	8
1908	An-feng	Anhwei	Gunboat	122	18	8.6	145	350	6
1908		Li-chi Co.	Dredge	118	20.8	8.2			
1908		Li-chi Co.	Dredge	118	20.8	8.2			
1910	Lien-ch'ing	Ministry of Navy	Steel Gig?***	173	25	12.6	500	1000	9
1910	Shu-t'ung	Ch'uan-chiang Co.	Steel Shallow Water Vessel	115	15	6.6			
1911	ch'eng-hai	Yen-t'ai Customs Taotai	Steel Gunboat	100	17	9	150	350	8
1911	K'ai-huan	Ya-hsi-ya Co.	Steamship	150	27	6.9		110	
1911	Chiang-hua	China Merchant Co.	River Steamer	330	47	14.9	4130	3000	12

* Altogether between 1905 and 1912, 130 vessels were completed. This listing includes only those of more than 100 feet in length.

** tso-ch'uan 座船

⑧ CCKT III, 101.

Peking representing the New York Shipbuilding Company, a subsidiary of Bethlehem Steel. He concurrently held the post of Attache Naval adjoint. The following year, Prince Tsai-hsun, younger brother of the regent Tsai-feng, was appointed head of the Commission of Naval Reorganization; in this capacity, he led a mission to Europe the United States and Japan for the purpose of studying naval affairs. While in the United States, Tsai-hsun was hosted by Commander Gillis who had returned for the occasion and Mr. Charles M. Schwab of Bethlehem Steel. During the visit Tsai-hsun and Schwab reached a preliminary understanding for the purchase of Chinese naval materiel in the United States and rights for New York Shipbuilding to carry out naval works in China involving the Kiangnan Shipyard. Subsequently Tsai-hsun returned to China and was appointed Minister of the Navy. Gillis and Schwab both showed up again in Peking in October 1911. Secret talks were held by Schwab and Tsai-hsun in that city until the two moved to Tientsin, on October 22, where a contract was signed on November 3. The terms reportedly provided for a loan of \$30,000,000.00 to China to be used among other things for shipbuilding and docks with a commission to Tsai-hsun of 300,000 taels. The contract was signed on the very day that an act of the new National Assembly prohibiting Manchu princes from holding cabinet posts stripped Tsai-hsun of ministerial authority. Subsequently, in October 1912; Premier Hsiung Hsi-ling confirmed that there was an agreement with Mr. Schwab regarding the loan. However the loan was not completed owing to the change in government. But in 1917, Premier Tuan Chi-jui, while parrying Japanese and British attempts to reorganize Kiangnan, cited the understanding originally given to Mr. Schwab by Prince Tsai-hsun as the basis for an American claim for the right to

reorganize not only the Kiangnan Shipyard but the Arsenal as well!®

Remarably, this imperialist intrigue and official venality had no detrimental effect on the operations of the shipyard prior to 1912. From the time of its separation from the arsenal in 1905, the arsenal was relieved of the overhead and operating expenses of those plants which had joined the yard. And, beginning in 1905, those plants which remained after the separation started an internal reorganization of their own design to make the most effective use of the arsenal's greatly reduced income. The new guidelines were set by the Military Reorganization Commission; they stressed ammunition production and steel refining. Southern Commissioner Chou passed these directions on to the arsenal with a warning to correct the personnel and production deficiencies noted during T'ieh-liang's inspection. Chou hired a Japanese expert to head powder production. It was probable that he was not satisfied with Director Wei's attitude toward reorganization. In mid-1905, he reported to the Military Reorganization Commission that he and Northern Commissioner Yüan Shih-k'ai would select a new director this proved necessary to carry through reorganization. Subsequently, in October 1906, as noted above, Chang Shih-heng, a nephew of the late Governor General of Chihli, Li Hung-chang, and a member of the staff of the Military Reorganization Commission, was named director. ®

When Chang took over management of Kiangnan on October 6, 1906, he found that production had already been sharply curtailed because of

® BPP F . O., 288/2708, Donaldson to Hoare, May 12, 1917, and minutes on reorganization of Kiangnan Arsenal.

® Chou Fu, *Op. Cit.*, letter to Kiangnan Arsenal, dated Kuang-hsu 31/7/15. NCH, Oct. 12, 1906.

the savings program. The arsenal's thirteen original plants had been reduced to seven. Production of guns was at a virtual standstill. Gun ammunition production had been disrupted by the transfer of the shell factory building to the shipyard. Though another plant was being equipped to make shells, production had not yet begun. The emphasis in production was on small arms, small arms ammunition, and steel refining. The 7.9 mm Mauser rifle was still being produced and output had increased to about 16 per day. However, the future of rifle production was uncertain. Orders had been received to change over to the new 1905 model Mauser, but the Military Reorganization Commission had not yet reached a decision on the bore diameter; the arsenal could only delay its arrangements for conversion pending the Commission's decision. Rifle cartridges were being turned out at the rate of 25,000 per day; Siemens Martin steel was refined and processed for ordnance production, naval construction, and non-military uses such as production of rollers for government mints and steel plate for sales to local firms. Annual costs for steel refining, which included the purchase of foreign scrap, were more than 200,000 taels, but 50,000 to 60,000 taels of this amount were returned through sales. The savings program had apparently had no effect on personnel policies, for the work force had grown from 2,800 to over 3,000 during the past two years. ①

In November, 1906, the reorganization of the Board of War was announced. The new Ministry of War, as it was called, absorbed the Military Reorganization Commission. The imperial government, having grown fearful of Yüan's domination of the latter institution, excluded

① *NCH*, Oct. 12, 1906. *YWYT* VIII, 349-50.

him from membership in the new ministry. Shortly thereafter Director Chang Shih-heng submitted his initial proposals for reorganization to the ministry via the two commissioners.⁷⁹ Chang's first proposal dealt with the production of small arms ammunition. The purchase and installation of new ammunition machinery capable of producing 5,000,000 rounds each of 7.9mm and 6.5mm cartridges each year and the expansion of facilities to house the new machines would require an investment of 148,400 to 158,400 taels. To support this production of rifle cartridges, 250 to 260 pounds of rifle powder would have to be produced each day. Daily production of another 140 to 150 pounds of gunpowder was required for supply of fort and shipboard guns. The investment in machinery and facilities—including the associated acid plants necessary to reach these levels of production was set at 88,700 taels. Another 300,000 to 400,000 taels would be required for: changeover to limited production of the 1905 model Mauser rifle at a new bore diameter; specialized production of 7.5cm quick-firing guns with retractable barrels; expansion and improvement of steel refining; and modernization of gun ammunition production. In his only proposal for personnel reorganization, Chang anticipated that after the new machinery was installed, a quality control system could be introduced and then piece-work payment could be initiated. For the time being, he urged that workers' wages be increased to stop the exodus of skilled Kiangnan artisans to the Hanyang and Szechuan Arsenals where pay scales were higher.

The total cost of implementing Chang's proposals would run from 550,000 to 650,000 taels. Annual income remained at about 1,400,000

⁷⁹ Ralph Powell, *The Rise of Chinese Military Power 1895-1912*, (Princeton: 1955), 197-8.

taels, but the full 700,000 taels for the establishment plan for the North China arsenal was again being deducted from this sum before it reached Kiangnan. The remaining income was entirely consumed by the cost of current production. Therefore, a separate allocation would be necessary to finance Chang's proposals. He requested the return of 796,000 taels owed to the arsenal by the Nanking Mint and another 300,000 which the arsenal had loaned to southern maritime defense funds in 1903. Pending receipt of these funds, he proposed to borrow the necessary amounts to begin carrying out his plans. These proposals were approved by Northern Commissioner Yüan, pending final approval of the Ministry of War. ⑳

Though it is unclear how financing was accomplished, at least some of Chang's proposals were carried out, for, in late 1909, he reported to the two commissioners and the Ministry of War that favorable results had been achieved in steel refining. Production of Siemens Martin steel had reached 14 tons per day. In addition to this, 130 to 140 pounds of crucible steel was produced daily and 39,000 pounds of nickel steel was produced annually for rifle cartridges. However, 50-60% of all raw materials for steel production still came from abroad. Much of this steel was used for tool making to supply the arsenal's own needs; steel plate and bars were sold to other government industries and commercial firms.㉑

The remainder of the arsenal's steel output was employed in the production of ordnance and ammunition. Progress in ordnance production was noteworthy even though financial restrictions imposed by the savings,

⑳ *PYKTLT*, 993-99.

㉑ *PYKTLTHP*, 1608-10.

program made the acquisition of new machinery impossible. A new standard bore diameter of 6.8mm was finally adopted in 1906 and in that year the arsenal changed over its production. Due to machinery shortages, the new weapon was 20% handmade. Output, nevertheless, reached twenty to thirty per day at a cost of 26 taels per rifle. Accessory parts and cast steel were Purchased from Great Britain. In 1909, the 6.8mm carbine was introduced. About 3,000 of these could be Produced each year; cast steel and accessory Parts continued to come from Great Britain. Production of the 7.5cm retractable-barrel quick-firing artillery Piece, which also commenced in 1906, was accomplished partially by manual labor. Output reached fifty guns per year at a cost of 4,300 taels each. ⁷⁵

In late 1909, Director Chang reported that improvements in the small arms ammunition plant were complete. Modernization had been greatly complicated by the prolonged delay in deciding on a national standard bore diameter for military small arms. Though the 6.8mm rifle had been adopted in 1906, the 7.9mm Mauser was still widely used, as was the Japanese 6.5mm Meiji rifle. Kiangnan renovated its old plant for production of 7.9mm cartridges and built others for the production of 6.5 and 6.8mm. Total annual production capacity was 10,000,000 rounds, though it is not certain that this figure was reached. Though the cartridges were produced from steel refined at Kiangnan, metals used in the projectiles were purchased from Great Britain and Austria. production of gun ammunition also reflected the heterogeneous character of the weaponry of China's armed forces. After 1905, a variety

⁷⁵ CCKT III, 49 50. *PYKTLTHP*, 1604

of shells from 5.7 to 8.7cm caliber were produced, employing steel refined from Hupeh ore and other metals purchaed from Great Britain.^⑥

Perhaps the most important aspect of the reorganization during the years from 1905 to 1910 was the failure to improve personnel procedures and management. As a result, excessive personnel costs and waste continued to rob Kiangnan of its greatly diminished production funds. The seriousness of this situation was indicated in a report which Director Chang submitted at the end of 1909. He pointed out that the arsenal was experiencing severe financial difficulties. When the new ammunition and powder plants began production in 1909, it was necessary to temporarily suspend the savings program for the new arsenal for a period of four months in order to provide the funds needed to support the new production. Chang observed that, in the future, it would be impossible to meet the Ministry of War's demands for increased ammunition production if 60,000 taels were deducted from the customs allotment each month before it reached Kiangnan. He cautioned that production cost for an annual output of 10,000,000 cartridges would cause a sharp increase in overall expenditure. Monthly expenses for wages alone were already 40,000 taels. After five years of reorganization, cutbacks in operations and streamlining of production, personnel costs had increased by 10,000 taels per month. Nothing could demonstrate more dramatically the failure of the Kiangnan management to come to grips with the crippling problem of personnel administration. Chang's proposed solution to the financial problems completely ignored the possibility of more economical management. Instead, he recommended the same

^⑥ CCKT III, 49-50. *PYKTLTHP*, 1612-18. *BPP F. O.*, 228/2294.

expedient which Director Wei Yun-Kung had suggested five years earlier adjustment of the monthly savings for the new plant to half of the customs allotment rather than a flat 60,000 taels. ⑦

This report appears to have rekindled imperial interest in the status of strategic industry an interest that had flagged once the Ministry of War had extended its control over Kiangnan in Shanghai in late 1906. Three years elapsed and nothing was done to get started on the North China plant; now Chang's report made it clear that the cost of operations in Shanghai was endangering the savings program for the new plant. But the ministry, instead of moving to reform the management in Shanghai, proposed a new solution designed to bring the arms and ammunition output of Kiangnan and all the provincial arsenals under central control in North China. This plan called for centralized control over all arsenals and the establishment of an arms depot near Peking to which their products would be shipped for storage. ⑧

These recommendations resulted in the imperial government initiating a full scale nationwide investigation of military industry. Chu En-fu, the official selected to conduct this investigation, submitted his report in 1910. He proposed a sweeping reorganization of all arsenals to bring production, within six years, to the levels necessary to supply the thirty-six proposed divisions of China's new army. Specifically, he recommended the creation of a system of five centrally-controlled and financed arsenals. This would be accomplished by modernizing the existing plants at Canton, Chentu, Hanyang, and Te-chou, and consolidating Kiangnan with Nanking. The finance for this plan would be provided by the 3,000,000

⑦ *PYKTLTHP*, 1619-23.

⑧ *Ch'ina-ch'ao hsu wen-hsien t'ung-k'ao*, 9849.

taels which chu reported had been accumulated by the Kiangnan savings program. Half of this amount was to be allocated for improvement of the Te-chou Arsenal on the Shantung-Chihli border not far from Peking.⁷⁹ This plan would have had the effect of diverting the savings from the Kiangnan customs allotment to military industry in North China, hopefully, before the mounting financial crisis at Kiangnan necessitated dipping into these funds further to defray the ever-increasing cost of current production.

Indeed, Chu's report revealed conditions at the Kiangnan Arsenal which leave no doubt that production costs were robbing the arsenal of its productive power and threatening the accomplishment of the savings program. He reported that operations in all the plants, excepting only the gun ammunition factory, were inefficient and wasteful. He found the gun, rifle and steel refining plants in a state of utter confusion. Among the more serious abuses which he observed were the sinecures held by officials, managers, and artisans; extravagance in purchase and use of materials; and the confused state of financial accounting. To remedy this situation, he advised that it would be necessary to clean out the sinecures and enforce economy in management; otherwise it would be impossible to reduce the excessive costs of production.⁸⁰

While it is unclear whether or not this last proposal for centralization was ever adopted, it is certain that the proposed merger of Kiangnan with Nanking was not carried out. In 1911, the Ministry of War submitted another plan which called for centralized control and financing of all military industry and provided for the continued operation and develo-

⁷⁹ Ibid., 9891.

⁸⁰ Ibid., 9850.

ment of the Kiangnan Arsenal.^⑥ The latter proposal, at least, was accepted. The final disposition of the 3,000,000 taels which had been accumulated at Kiangnan also remains unclear, though it seems likely that it may have provided the initial capital for this centralization scheme.

During the five years following the imperial government's takeover of Kiangnan in 1905, a determined effort was made to reorganize and improve the arsenal's production. However, personnel problems inherited from an earlier era continued to rob Kiangnan of its greatly diminished operating capital and dependency on imported materials meant that production could still be interrupted at the whim of a foreign supplier. Furthermore the variety of calibers among the small arms and artillery employed by China's armies forced Kiangnan to adopt a costly pattern of diversification in ammunition production. Despite these prodigious obstacles, all evidence points to the fact that the output of steel, ordnance and ammunition increased sharply during these years. Quality was presumably satisfactory for reports such as Chu's which attacked almost every aspect of arsenal operations demurred on the matter of quality. What is perhaps most significant is that all this was accomplished with an annual income cutback drastically from what it had been in 1904.

For all its shortcomings and its prodigious problems, there was a well of resourcefulness left at the Kiangnan Arsenal and Shipyard at the close of the dynasty. The production figures leave no doubt about this. The same cannot be said, however, for the imperial government. It

^⑥ *CCKT* III, 59,

had halved Kiangnan's income and cutback its physical plant but failed to establish the North China arsenal for which all these sacrifices had been made. It appears that there were two important reasons for this dismal situation. First, after centralizing half of Kiangnan's income, military authorities in Peking lapsed into inaction; nothing was done about getting started with the establishment in North China. This leadership vacuum seems related to the imperial government's split with Yüan Shih-k'ai in 1906. Yüan was an experienced "arsenal builder"; the Manchu princes who dominated the Ministry of war were not. Venality at the highest level of leadership was shockingly apparent in the unsavory dealings concerning the shipyard. Secondly, it appears that the high cost of operations at Kiangnan, even after the cutbacks in 1905, seriously undermined the imperial government's savings program. Between the time that T'ieh-liang froze the arsenal's assets in September, 1904, and the time of Chu En-fu's report in 1910, if the savings program had operated as specified by the edicts, there should have been an accumulated sum of over 4,000,000 taels instead of the 3,000,000 which Chu reported. The differential of 1,000,000 taels, or about 25%, suggests the degree of noncompliance with the government's savings program resulting from the high cost of operations at Kiangnan.

Kiangnan During the 1911 Revolution

For Kiangnan and the ancient imperial regime which had spawned it the hour was already very late. The tensions that must have been building within the arsenal between those who carried through the production reforms of the past five years and those who continued to plunder arsenal funds by packing the payrolls erupted during the

revolutionary convulsions that shook Shanghai in the Autumn of 1911. During the summer of that year, a disillusioned proctor of the arsenal, Li Chung-ch'io made contact with the revolutionary leader Ch'en Ch'i-mei who had recently arrived in Shanghai to organize activities of the T'ung Meng Hui in the Yangtze Valley. After the revolt at Wuchang on October 10, 1911, a revolutionary conspiracy composed of Li, Ch'en, Shen Man-yun (chairman of the Hsin Ch'eng Bank), and leaders of the fire department, the police, and the Merchant Protection Corps watched the development of the revolution, awaiting the right moment to take action.

On October 14, Li and Ch'en were successful in persuading Wu T'ing-fang to join the new "people's government" as foreign minister. Li himself declined the post as head of the government. On the same day, the commander of the Wu-sung Forts and the head of the arsenal's security force joined the revolutionaries. With this newly acquired strength, Ch'en decided to attack and take over Kiangnan. He mustered his supporters outside the west gate and attacked at eleven o'clock that evening. His forces were repulsed.

Li, whose part in this conspiracy was still unknown to Arsenal Director Chang, spent the next several weeks trying to dissuade Chang from sending guns to the government forces holding Nanking. During this time the arsenal received frequent telegraphic instructions from the Liangkiang governor general to speed up the production of munitions. Finally, in late October, a special allocation of 100,000 taels was sent to the arsenal from the Kiangsu Provincial Treasury. Li, who still enjoyed the trust of the director, convinced him that, rather than depositing this sum in a bank, it would be safer to rent a house next

door to Li's own home and place the money there under the guard of members of the arsenal's security force.

Once this had been accomplished, the revolutionaries, impatient over their inability to stop the arsenal's shipments to Nanking, launched another attack. On November 3, taking advantage of the relaxed security measures at 5:00 P.M. when the work force departed, Ch'en and a group of revolutionaries stormed the arsenal. Again, they were forced to withdraw. This time, Ch'en was taken captive. That evening, while Proctor Li Chung-ch'io sought to obtain the release of Ch'en, the revolutionary party refrained from further attack on the arsenal because of Ch'en's presence within. However, during the night, a group from the Merchant Protection Corps got over the perimeter wall behind the rifle plant and set fire to it. In the confusion and fighting which followed, Director Chang fled, by small steam launch, to the foreign concessions. The revolutionaries and the Merchant Protection Corps thereupon overran the arsenal and found Ch'en unharmed.

The next day, November 4, Li returned to the arsenal to find that the revolutionaries had taken about 1,000 Mauser rifles and large amounts of ammunition. On November 5, he made emergency payments to the revolutionary troops which had gathered in Shanghai to forestall their causing trouble with the populace. On the same day, Li accepted the post of head of the People's Government in Shanghai, while Ch'en took control of the military forces. Meanwhile, Li had put the 100,000 taels allocated to the arsenal several days previously at the disposal of the revolutionary leadership. This sum constituted the principle fund for finance of the revolutionary government right after the liberation of Shanghai.

The events of the evening of November 3, 1911, resulted in the liberation of Shanghai from imperial control and the passage of the ownership of the Kiangnan Arsenal to the new revolutionary government. However, the arsenal had not quite played out its role in the drama which marked the demise of the ancient empire. The revolutionary attack on the Liangkiang capital, Nanking, was stymied during late November due to the lack of heavy artillery to breach the city wall. An appeal was made to Kiangnan to send two 4.7cm carriage-mounted field guns. Though unable to meet the requirement from its existing stores, Li, who had taken over as director of the arsenal, had several foreign technicians from the gun plant take down two forty-pound guns from the Wu-sung Forts, mount them on vehicles, and, together with ammunition and fuses from Kiangnan, they were dispatched to Nanking. On December 3, these guns were in position outside the city ready to fire. On the morning of December 4, after 53 rounds had been fired into the city, Nanking capitulated to the revolutionaries. Ironically, Kiangnan had delivered the death-blow to the provincial government which had created it, and over the years, had struggled so unceasingly to control it. ②

Conclusions

The reforms attempted at the Kiangnan Arsenal between 1895 and 1911 failed to provide China with the secure, self sufficient, modern military-industrial capability which she so sorely needed. In the first place, Kiangnan was still obliged to rely on costly foreign supply for

② T'ang T'o, *Op. Cit.*, 287-96.

certain key items. Though a great deal of headway was made in developing domestic sources of supply during these years, China was not, as yet, able to provide all the materials needed at the arsenal. It is impossible to determine how much the added costs of imported materials raised the overall cost of production, but it is certain that reliance on imports robbed Kiangnan of its strategic potential. At a time when China was attempting to stave off steadily increasing imperialist pressure, the Ch'ing government was looking to these same imperialist powers to supply essential materials to its foremost defense industry.

Secondly, Kiangnan still employed foreign technicians in the process of production. However, the authorities at Kiangnan were particularly concerned about this; they established technological education at the arsenal and dispatched students to Japan. Although these measures did not immediately provide a reservoir of trained technicians, only a very few foreigners were employed at the arsenal and they were not a financial burden as at other plants. At the shipyard, foreigners played a greater role but, after the untoward incident involving Mr. Basse in 1906, their authority was strictly circumscribed. Still, operations at the shipyard probably would have been seriously disrupted if foreign technicians were withdrawn. The arsenal, on the other hand, was clearly more self-sufficient. The withdrawal of foreigners would have hurt but it probably would not have effected production as grievously as an interruption in foreign supply.

Thirdly, the personnel and purchasing procedures of Kiangnan's official managers seriously depleted production funds. In the period before 1905, this had the effect of depriving the arsenal of the funds required for the modernization of ordnance production machinery. From 1905 to

1911, the years during which income was restricted and modernization limited to the areas of steel refining, ordnance, and ammunition production, the high cost of operations, resulting largely from personnel expenses, seriously retarded the savings program for the development of military industry at the national level and created a financial crisis in the production of rifle ammunition.

Fourthly, because of the prolonged delay in establishing standards for bore diameters and ammunition sizes, Kiangnan and the Hanyang plant produced different caliber rifles from 1895 through 1901. This led to the use of varying sizes of small arms by the Chinese armed forces and Kiangnan was obliged to divide its scanty modernization funds for the establishment of three different ammunition plants in order to produce the required sizes.

Fifthly, Kiangnan was still in an exposed maritime site in Shanghai where it could easily be blockaded or subjected to naval bombardment by the western powers which enjoyed naval superiority in China's coastal waters. The failure to relocate Kiangnan at a secure inland site or to redirect its resources to the establishment of new and less vulnerable military industry was largely the result of the imperial government's inability to provide decisive leadership when the choice of a new location became complicated by provincial jealousies.

Among the several generalized causal factors underlying the failure of the reform movement at Kiangnan the omnipresent and overwhelming pressure of the imperialist powers seems to have been seminal. Imperialism made rapid military-industrial modernization a survival issue for the empire but military-industrial modernization could take place rapidly only under foreign tutelage. The reliance on imported materials

and the limited reliance on foreign technicians which resulted from this tutelage ultimately destroyed the arsenal's meaning as an anti-imperialist institution. But imperialism and the foreign dependence which it engendered were, by no means, the sole problem undermining reform at Kiangnan. As we have seen, the wasteful and inefficient personnel practices of arsenal directors and supervisors deprived Kiangnan of the financial resources needed for modernization. However it does not seem wise to speculate further, as some have done, that such personnel practices were a function of the traditional ethos in which confucian familism played a central role, for Chang Chih-tung, the outspoken champion of personnel reform at Kiangnan during these years, was also a nationally known exemplar of confucian values and Chang was not alone. ⑧

Perhaps the most fundamental domestic factor impeding Kiangnan's development during these years was the ambiguous and indecisive leadership of the imperial government. The court revealed its style of leadership as early as 1895, when it pitted local officials in the Liangkiang Provinces against Chang Chih-tung in an effort to check Chang's ambitions toward Kiangnan. The reassertion of Liangkiang provincial control retarded reform at the arsenal until 1902 when the death of Liang-kiang Governor General Liu K'un-i and the reform spirit afoot in the empire once more raised the possibility of revitalizing Kiangnan. Again the court stood by as a power deadlock over control of the arsenal

⑧ Cf. John L. Rawlinson, *China's Struggle for Naval Development 1839-95*, (Cambridge: 1967), 202-4. For an earlier view of this period by the present author see Thomas L. Kennedy, "The Kiangnan Arsenal 1895-1911: The Decentralized Bureaucracy Responds to Imperialism.", *Ching-shih Wen-t'i*, 1969, 17-37. See also John Schrecker, "Late Ch'ing Responses to Imperialism." in the same volume 5-15.

developed between Chang and Liangkiang Governor General Wei Kuang-tao. Imperial control was finally asserted by virtue of a short-lived alliance with Yüan Shih-k'ai. But once more the court shrank from the challenge of positive leadership. Though it centralized one half of Kiangnan's income and cutback operations at the Shanghai plant, it never followed through with the establishment of the promised arsenal in north China. Indecision and hesitation also characterized imperial leadership in the matter of setting national standards for ordnance and ammunition.

Although the Bethlehem Steel plot did not have a direct effect on the arsenal in this period, it is instructive with respect to understanding how these factors interacted. The venality of Prince Tsai-hsun and the monstrous audacity of Mr. Schwab's proposals exemplify the depths to which imperial leadership had sunk, the aggressive position which financial imperialism had assumed in China and the way the two worked hand-in-glove and reinforced each other's motives. Under these conditions, it does not seem unusual that reform was not successful. On the contrary, it seems extraordinary that Kiangnan was able to survive at all as an institution working for modernization in China and resistance to foreign pressures.

But the reform attempts at the Kiangnan Arsenal cannot be dismissed as a complete failure. Somehow, in 1911, with only half the income and half the buildings it had in 1905 and still bedeviled by the same personnel and management problems of earlier years, Kiangnan was producing more than twice as much useable steel and ammunition and as much ordnance as it had in 1905. Production in the final analysis is an important measure of an arsenal's accomplishment. While it is

impossible to pinpoint the forces at the arsenal or in the government hierarchy which effected this progress, the revolutionary activities of Li Chung-ch'io suggest the kind of deep changes that were taking place in the minds of certain intermediate level officials in China's ruling bureaucracy. Frustration with the prolonged negative leadership of the court and the inefficiency of Kiangnan's bureaucratic management and impatience with the arsenal's prolonged failure to strengthen China against mounting foreign pressure presumably drove Li into the revolutionary camp. Pending further research which hopefully will provide a closer look at Kiangnan's operations during the last five years of the Dynasty, we may speculate that a similar type of revulsion inspired officials in the administration of Chang Shih-heng to reform the arsenal's productive processes and bring output to the highest point in Kiangnan's forty-six year history.

本篇中文提要

光緒廿一年甲午戰爭結束後，北京及兩江有關臣工坦率承認，由兩江當局經營的國有江南製造局，三十年來一無所成。甲午戰爭之際，江南製造局因未能在現代化體制及標準下生產武器彈藥，故對中國的戰力並未作預期貢獻。要言之，該局經營失敗因素約有四端：依賴昂貴的進口原料；仰賴外國技術人員指導主要生產部門；中國籍管理人員之不稱職；以及所在地鄰近海岸，易受外國海軍力量威脅。由於購置原料及人事費用過鉅，材料運用不當，江南製造局的經營所費不貲，每年由上海海關洋稅項下所撥經費僅敷支應。故自光緒元年起停止建造輪船，亦無餘力充實或更新現代化軍械生產設備。結果甲午戰時，該局能以供應的武器彈藥數量既少，品質亦復奇劣。

光緒廿一年至宣統三年間，主管當局雖一再針對江南製造局的缺點及經營方式

認真設法改善，但仍舊無法建立一個中國所亟需的自給自足的現代化兵工業體系。究其原因，不外：第一，江南製造局雖在煤、鐵等供應上已逐漸不假外求，但若干主要原料仍需進口。依賴進口原料不僅提高了成本，而且嚴重削弱了該局戰略潛力。因當時中國正企圖擺脫不斷增加的帝國主義壓力，而清廷反需向列強購買主要生產原料，建設本身國防工業。

其次，江南製造局在生產作業上一向雇用外國技師。該局固已着手訓練本國技術人員，並派遣學生赴日進修，所用外人為數不多，並不構成沉重的財務負擔。然造船部份仍以外籍技師為主。一旦外人離去，工作勢必停頓。兵工廠部份情況則較前為佳。

第三，江南製造局的人事費用及主管人員採購陋習，掏罄全部生產預算。以致光緒卅一年前，軍火生產設備無法汰舊換新。光緒卅二年至宣統三年，清廷為搏節財源，全力籌設中央直接控制的華北新兵工廠，乃緊縮江南製造局經費，減少生產。然龐大人事開支使得此一節流計劃效果大減，因此而產生的財務困窘亦影響到該局正常彈藥生產量。

第四，清廷久未劃一槍炮口徑及彈藥規格，江南製造局被迫以有限設備，建立三部份軍火生產單元，以供需求。

最後，江南製造局位於濱海地區，易受封鎖，尤易為當時控制中國海域的列強海軍砲火所轟擊。朝廷每議遷地為良，各省督撫即相互猜忌爭取，北京遂因難作決定而予擱置。

除以上臚列各點外，無處不至的帝國主義巨大壓力，當為江南製造局改革失敗的根本原因。清廷因列強優伺而刻意加速兵工業近代化以自救，然兵工業近代化若無列強協助即不能速見其功。這一情勢使江南製造局終於無法成為國防工業的基地。主管及監督人員之缺乏效率，則為另一重要因素。他們在財務上的侵蝕及浪費，使該局的改革無從着手。事實上僅張之洞及少數幾個人，堅主改革人事制度。

這一時期中，阻礙江南製造局發展最基本的內在因素，則為清廷的曖昧及因循態度。清廷曲容地方官吏彼此爭鬪，以牽制張之洞對江南製造局的構想。類似的地方性利害衝突，使得該局的改革運動無法推動。直到光緒三十二年，清廷才在袁世

凱的短暫合作下直接控制該局。但不久北京似又無意於此，而任其自然發展。此期間，清廷雖支配了江南製造局一半的營運收入，並規整了軍火生產類型，但終未能將華北籌設新兵工廠的計畫付諸實現。海軍衙門與美國伯利恒鋼鐵公司的合作，使便該公司獲得江南製造局造船部份甚至軍火生產部份的控制權，顯示了清廷官吏之易為利誘、西方金融帝國主義之無孔不入、以及二者之互濟為惡。在這種情形下，江南製造局能繼續存在，堪謂異數。

江南製造局的所有改革努力，不能說全部失敗。宣統三年時，該局的設備及經費僅為光緒三十一年的一半，棘手的人事及管理諸問題亦一如往昔，但却能生產兩倍於光緒三十一年之鋼鐵和軍火。其原因雖不易具體說明，但似乎是由於該局的中級人員氣沮於朝廷的消極態度和無效率的官僚作風，並對兵工業經營迄未能使國家强大到能以應付列強壓迫感到自疚，而發奮改革生產程序，結果把生產量提高到四十六年來之最高點。