

folgende einfache, für alle widerstandsfähigen Gläser passende Regel zusammenfassen: Ein gutes Glasgemenge muss so viel Kieselsäure enthalten, dass sich das 5 bis 6 fache Alkalisilicat und die einfachen oder noch besser die zweifachen Silicate der anderen Oxyde bilden können; für die Thonerde wäre aber wohl immer das 3 fache Silicat anzunehmen, welches in der Weissglühhitze erweicht. Dabei muss eine genügende Menge amorpher Silicate vorhanden sein, um gegen Entglasung zu sichern.

Aller Wahrscheinlichkeit nach lässt sich diese Auffassung der Glasgemenge auch auf farbige Gläser übertragen und ist es wohl anzunehmen, dass in den hier aufgestellten Formeln sich für CaO, BaO, PbO auch die Oxyde von Schwermetallen einführen lassen. Hierüber wären noch Versuche anzustellen.

Bei Gläsern, welche als Flüsse u. dgl. gebraucht werden, oder überhaupt sehr schmelzbar sein müssen, wären vielleicht andere Alkalisilicate als das 5 oder 6 fache anzunehmen.

## 織物工業學校意見書

(榎本農商務大臣に提出せし英文の邦譯)

### 1

織物工業は國內消費若しくは海外輸出の何れにせよ國家産業中最も重要なものであるから佛蘭西、獨逸、白耳義等の諸國に於ては政府として細心の注意と深甚な獎勵を怠らざることを常とする。此の工業を確立し發展を助長する方策としては實際的及び理論的教育の最も効果ある組織及び斬新な機械工具を設備するための補助金が擧げられる。理論的と實際的の企業が兩々相密接したる實習が行はれるやうな學校に實業界が大なる援助を與へる時初めて完全な効果を奏することとなる。

歐羅巴に於ては斯の如き教育はいはゆる製作學校即ち理論的と同時に實際的教育を與へる施設に於て行はれる。この仕組の教育には一般に三種の過程がある。其の第一は織物工場或は會社の社員又は使用人養成を主とするものである。其の教育課程は六ヶ月間で機織法通論、各種織物理論、機織の豫備操作、各種製品の分解と組織、總ゆる織物に對する織機の準備、原價計算、製造と經濟的處置、機械製圖及び圖案に對する實際的説明と實習を行ふ。又染色及び仕上に就いて教授する。

第二のものは一は實際の織物職工に各種の技術を教へ織物製造を監督し或は自分自身で行ふ事の出来る織物教師に完全に仕上げる目的を持つものである。之に對しては既に織物に経験を有する者及び雇主又は親方の證明あるものに限られてゐる。此の教育課程は一ケ年間で同様な方針により商業方面に關する理論講義は一時間を一回として毎週五回行はれる。此生徒は學校の織機によつて成した仕事には普通の給料を受ける。かかる仕事の注文は學校に關心を持ち運用資金を提供した人々から與へられる。

第三のものはこれ又既に機織に關係の深い人達に對するもので機械的機織法に關する課程である。之は機械蒸氣或は水力によつて動く力織機を使用する機織法である。

ライン河畔クレーフェルトの有名な織物學校には頗る完備した染色及び仕上に就ての理論的且つ實際的な教育課程がある。ウルテンベルヒの首都ロイトリンゲンの學校には一八七五に三十六臺の手機と十臺の力織機があつた。是等の織機を以て總ゆる種類の毛木綿麻絹或は交織の製品が極く簡單なるものから最も複雑した模様のもの迄製作された。總べての國々あらゆる時代の標本、製圖、書籍、圖案、見本の多大なる蒐集は生徒の爲に

陳列されてゐる。

或場合には學校が政府に所屬するものである。さもなければ製造家と商人の協會が必要な運用資金と機械の一部を提供してゐる。又組合は建物を寄附し政府は機械を購入し教員の俸給の支拂ひを管理してゐる學校もある。

獨逸佛蘭西其他に於ける織物學校が織物工業の進歩に貢獻した事は疑ふべくもなく又其の國に良き教養をうけた商人製造家及び織物教師を與へたのである。此の様な諸例の例外たる事なく日本も亦之を研究し追隨しなければならぬ。今や最も重大なる利益が危機に瀕してゐる。織物工業は總べての工業中最も重要なものに數へられる。日本の織物職工が非常に立派な織物を製造してゐる事は全く事實に相違はないが併し同じ品物が百年若しくは二百年以前に同一の機械を以て生産されてゐた事を忘れてはならない。歐羅巴にあつても亦かかる品物は同様の方法で製出された。聰明と熟練と忍耐が如何なる美しい品物をも作り得る事は確かである。

併し今日の工業は夫以上のものを要求する。與へられたる目的に對して出來得る限り僅少の勞力と費用を以て最良の物を作る事を欲するものである。日本では

古代の方法をその儘繼承してをり二三の細部が外國人との交渉によつて近年改良されたに過ぎない有様である。歐羅巴に於ては全工業が變化してしまつた。

此の變化は日本には全然或は殆ど存在せぬ諸原因によるものである。全歐羅巴の各國間の競争遠近諸國との交易による刺戟、各種原料の無制限の供給、機械及び化學に關する諸科學の驚くべき進歩は織物工業の商業的狀態のみならず技術的方面をも變化させてしまつた。亞麻、大麻、羊毛、絹、木綿等の原料は極く細い絲から極めて太い絲迄單一或は混合して使用される。其の結果現在では以前よりも遙に多數の種類の製品が製造されてゐる。手織機、力織機何れも多大の改良が行はれた。仕上工程並びに豫備操作に對する機械も亦同様である。應用化學に依存する染色その他の操作は驚くべき進歩を遂げた。幾世紀間の總ゆる經驗とすべての科學が助力者として動員された。その結果歐羅巴の織物工業は何れの部門を問はず設備及び操作は科學の原理に基く事になつたのである。之等の原理に關する知識それを應用する習練が各商人製造家又は織物職工に對して最も安全なる手引を成してゐる。

日本工業の歴史は別種のものであつた。併し今や家庭工業はより一層外國工業と競争しなければならなく

なるであらうし此國が富むにしたがひ家庭の消費がより増加するのに應じ又支那亞米利加及び歐羅巴の多くの顧客を考へる必要に迫られるから歐羅巴及び亞米利加に於ける急速な進歩の根柢に横たはる要素即ち知識を利用しなければならない。今日の工業はしつかりと科學的基礎の上に建設されてをり一工業を追求する人は何れもその基礎が何であるかを學ぶのを忘れないのである。

日本の織物工業も亦歐羅巴に於て此の工業に對して爲されたすべての事柄を習得する上には斯の様な恆久の原理に依存せねばならないのであらう。クレフェルド、ロイトリンゲン、リヨン其他の學校は斯の如き目的に多大の助力を爲し又大きな衝動を與へてゐる。

授業は商業的なると共に技術的なる二様のものと爲すべきで勿論單に歐羅巴のものに止らず絶えず日本の織物工業を參考として比較する事を要する。此の目的は企業心に富む日本人をして國內及び國外の最も重要な工業の總ゆる特色に親しましめる事によつて又商工起業に必要な技術的改良を理解し應用し得る様に教育することにより進歩への道を開拓する事ではなければならない。其の教育は織物職工と同様に商人も亦興味を持つ様な種類のものなるべきである。

相當の商人製造家及び織物職工が上述の如き職工學校が有益な機關であると確信を持つ事なくしては容易に成功がかり得られるとは思へない。何故ならばその効果ある組織私的な利益と理解を以て人々の幸福の爲に公共の事を考へて協力すべきだからである。

此の理由から斯の如き職工學校の設立を決定するに先立ち織物工業の大中心地例へば桐生、京都、大阪、東京、和歌山等の識見ある商人製造家織物職工の意見を聞く事がのぞましいと思ふ。

かかる人達との協議及び討論によつて多大の知識と意見が得られるであらう。之等を基として次の階段に進めばよいのである。

併し乍ら此の協議會を召集する以前にもう一度此の問題を繰返して述べるのは無駄ではないと思ふ。問題は日本に於ける織物工業に對する職工學校の設立にある。以下その組織の要點を記す事とする。

- (1) 本校は織物職工或は織物教師と商人或は製造家の二種の生徒を目的とする。
- (2) 第一種の生徒。専門の織物職工は機織法織物機械の機械的原理、原料、各種製品等の理論的講義によつて完全な實際教育を受ける。教育年限は一ケ年

で既に機織の初步に詳しく織物職工として勞働した者に限り入學を許可す。本校は機械に経験のない見習生を教育せぬ。

- (3) 此の工場には最も進歩した外國製の手機と豫備及び仕上工程に對する總ての附屬機械を蒐集する。該機は能ふ限り手動し得るを可とす。必要があれば比較のために日本織機の二三を加へて差支へない。
- (4) 主任教師は外人たるべく諸種の構造を其細部にわたり而も生徒が其機構の作用個々の構造の理由利益不利益を完全に諒解し斯くして改良の各階程を理解し各構造の成功不成功を觀取し且つ日本にとつて何れが最適なるかを判斷し得る様に説明する事を必要とする。
- (5) 生徒は一原料乃至は數種の原料を混合した内外各種織物の分解と組織を學修し織機を準備し自身で布を織る迄の始終の必要なる工程を施行し得る事を要する。此の學校を援助し振興する爲の假想の協會は能ふ限り販賣し得る織物を生徒に製作せしめその仕事に對して給料を受けられる様に留意すべきである。
- (6) 講義は日本並に外國諸國に於て機織に使用され

る原料を蒐集し其助に依りその總てに就いて行ふ。日本織機の使用法及び日本原料の教授に對しては日本人技師に俟つを可とするであらう。生徒は又その組織にしたがひ如何にして織物の値段を計算すべきかを學習する。

- (7) 理論的説明及び實際的説明と實習は生徒が自身で最も經濟的に與へられた品質と組織の織物を生産する各操作を指導し施行し得る様なものでなければならぬ。
- (8) 學校の機械中に外部の人にも使用し得るジャカード機用のカード・パンチング・マシンの如きものがある際には依頼により報酬を受け斯かる仕事を行ふもよい。
- (9) 學校が水車の如き原動機と相當の絹其他の製品に對する力織機を備へる事が出来るならばその利益は極めて大きい。斯の如き場合には其他の部門の生徒を力織機の作用に就いて教育し同時に企業心に富む日本人に近い將來に於て大に認められるに相違ない力織機を以て小設備を行ふに必要な教育を受けさせる。
- (10) 其他の部門の生徒は將來商店或は工場の主人となるべき生徒である。その教育は他の部分に比し

てより理論的でなければならぬ。併し乍ら生徒は機織の實際を充分に理解し如何なる操作が如何なる織機が與へられたる織物の製造に必要なかを知悉する爲に充分なる實習を行ふべきである。生徒は必要なる原料の性質と價値に精通し總ゆる製品の原價計算に習熟させる。併し他の部門の生徒の如く給料によつて製織する事はない。

- (11) 學校は織物工業關係者に對しては常に開放する。環境にしたがひ公開講演説明を行ふ。例へば織物織工や製造家を前にして比較實驗を行ふが如きである。約言すれば總べての規準は總ゆる關係者の協力により注意深い實驗と綿密な討論を以て如何なる機械が如何なる新機械が日本の工業に採用すべきかを決定するにある。
- 斯の如き技術的問題を決定した後に始めて關係者は斯かる改良を全國的に實地の技師たるべき第一部門の生徒の助力を得て施行する爲に要する經濟的關係の考察に到達するのである。結局職工學校は織物工業の商業的並びに工業的進歩に對する總ゆる努力の會合所ランデ・ヴーとなる様に經營しなければならぬ。勿論これは時間の問題である。併し乍ら堅忍と假令小なりと雖も日々の前進によ

つて最後には達成されるものである。

- (12) 若し織物學校に連絡して染色工場を得る時は日本に羊毛と紡毛絲を漸次導入する見地よりすれば日本工業に大なる寄與を爲すであらう。此の部門も亦歐羅巴の特殊學校に於て理論的並びに實際的に教養を受けた外人教師を依囑するを便とする。
- (13) 上述の觀點より染色に對すると同様機織法に對しても外人教師を依囑する事を勸告したい。之は經濟的並びに實際的の何れの見地よりしても日本青年を歐羅巴に派遣するより遙に優つてゐる。歐羅巴に於ける染織技術が基本的な科學原理の關する限りに於ては日本の同様の技術よりも相當に進歩してゐることは全く疑ふ餘地がない。日本の染織業者の手工的技術及び實際的經驗は偉大であつたであらうし又今尙偉大である。併し乍ら一工業全體の堅實な進歩は個人の技倆以外の要素に依存するものである。急速な進歩を遂げる爲には科學知識を實際の經驗に結合しなければならない。併し優秀此の點に關しては良き教養を持つ外國人に及ばない事は疑ふ迄もない。彼にとつて日本の實際を理解し何れが可なるか不可なるかを識別するは容易であるし如何なる日本の事物でも肩をす

くめる事なく知らうと努め公平に關與するであらう。二三年間歐羅巴に習學した日本青年では職工學校を經營するに必要な知識と經驗を得て歸朝する事は全く不可能である。採用すべき方針は希望ならば歸朝後に教師となすべく此の學校の優等生を歐羅巴に派遣するにある。併し是又日本に於て二三年間實際工業に従事して後の事にしたい。

- (14) 職工學校教育の傍生徒に數學、製圖、機械設計、自然哲學要論及び化學等の夜間講義を行ふべきである。之は外部の人の爲に行へばよい。歐羅巴に於ては此の様な講義は如何なる都市でも容易に求める事が出来る。日本の各都市に於て同様講義を設置するとすれば之又のぞましき次第であらう。外國語も外部の教授による課目とする事が出来よう。
- (15) 學校の財政的管理に關しては歐羅巴では全生徒が若干の月謝を納付してゐる。本制度は日本に於ても亦採用すべきである。多數の無月謝生徒を擁するよりは教育するに値する少數の勤勉な生徒を持つ方がよい。之は例外の場合には給費生制度を設定する事を妨げるものではない。

上記は唯かかる職工學校の主要なる特色と目的を説明することを目的とするのみである。更に詳細なる點

は斯かる機關が決定された後に於て綿密なる考察の對象とすべきものである。斯の如き計畫が大織物中心地の製造家と織物職工に賛成を得る事は最ものぞましい事である。此の様な職工學校の影響は適當に施設せらるならば其の範圍を遙に増大するであらう。教場としてのみならず同工業に關係ある總べての人士の協力を通じて進歩的な生きた運動の出發點更に中心地となるのは容易な事であらう。共通な利害を持つ人の斯様な協會は最も強力なる進歩の原動機關である。

明治二十一年十二月十六日

ワグネル

次にワグネル先生自筆の原文を掲ぐ。原文は當時榎本農商務大臣に提出されたもので其後山口貴雄氏の所藏となりしも昭和十二年十月六日同氏は之を東京工業大學圖書館に寄贈された。

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### Note on schools for textile industries

The textile industries, being amongst the most important branches of national production, either for home-consumption or for export, have been in several countries objects of careful and thorough encouragement by the Government, in France, Germany, Belgium etc. The means of fostering and promoting the said industries, have been a most effective system of practical and theoretical education, and the occasional subsidies for procuring better tools and implements. The success has been a complete one, chiefly in all those cases where private enterprise had a large share in the management of such schools where workshop practice went hand in hand with theoretical instruction and practical enterprise.

In Europe such instruction is given in so-called school-workshops, i. e. workshops affording practical as well as theoretical training. In these schools, generally three courses of instruction are given. One course is intended for those who are liable to become interested as partners or employees in commercial and manufacturing firms dealing with woven goods. Their course of instruction lasts 6 months, and is composed of theoretical lessons on weaving in general and the various kinds of woven goods, of practical demonstrations and exercises in the manipulations preliminary to weaving, in the decor position and composition of all sorts of goods, in the

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setting up of looms for any kind of cloth, in the calculation of prices and the economical disposition of manufacturing, in the drawing of machinery and patterns. Lessons are also given in dyeing and finishing.

The second & other course of instruction has the object to thoroughly train practical weavers, weaving machines able to teach any branch of their art, to superintend the manufacturing of woven goods, or to take it in their own hands. Only such people are admitted who have already some experience in weaving, and can bring a good certificate from their master or employer. This course of instruction lasts one year. Theoretical lectures on the same plan as for the commercial division are given five times per week for one hour. These pupils receive the usual salary for the work they do with the looms of the school. Orders for such work are sent in by those who are interested in the school and have furnished the working capital.

A third course of instruction, also for people already familiar with weaving, is that of mechanical weaving, that is weaving depending on the use of machines and power looms moved by steam - or waterpower.

In the celebrated weaving school of Beffell on the Rhine, there is also a very complete theoretical and practical course of instruction in dyeing and finishing.

In the school of Routhingen, Kingdom of Wurtemberg,

there were in the year 1875, altogether 36 handlooms and 10 power looms; with these looms, all kinds of goods, in wool, cotton, linen, silk or mixed materials were made, from the plainest to the most complicated patterns. A large collection of models, drawings, books, patterns, samples of all countries and all times, is at the disposition of the pupils.

In some instances the school belongs to the Government; in other places a society of manufacturers and merchants has furnished the necessary working capital and part of the machinery; the community has furnished the building; the Government has bought some of the machinery, pays the salary of the teachers and superintends the management of the school.

There weaving schools in Germany, France and elsewhere undoubtedly have done good service for the development of the weaving industry, and provide the requisite contacts with a well trained staff of traders, manufacturers and weaving masters. Such examples should not be lost on Japan, but ought to be studied and followed. Most serious interests are at stake; for textile industry is one of the most important of all industries. It is quite true that Japanese weavers have produced not magnificent cloth; but the same things were produced 100 or 200 years ago and with the same implements. In Europe too, such things were produced, and by similar means. Certainly

cleverness, skill and patience are not able to produce any kind of beautiful ware; but modern industry requires something more: it wants, for a given purpose, to produce best, with as little labour and cost as possible. In Japan, the ancient methods have not changed, except in a few details and this only during the last years, ~~and~~ though the intercourse with foreigners, in Europe the whole industry has been transformed.

This transformation is due to causes which have not at all or scarcely been working in Japan. Competition amongst all the countries of Europe, stimulation due to the intercourse with manufacturing and distant countries, unlimited supply of all kinds of raw materials, wonderful progress of mechanical and chemical sciences, have changed the technical as well as the commercial features of textile industry. The raw materials, hemp, flax, wool, silk, cotton, in the coarsest as the finest threads yarns, are used single or mixed; and a much greater variety of goods are made now than in former times; handlooms and powerlooms both have been immensely improved; so also the complements for the preliminary as well as for the finishing operations. Dyeing and all other processes depending on applied chemistry, have made wonderful progress. All experiences of centuries, all science have been called to assistance; and the result has been,

that the textile industry of Europe, in all its branches, appliances and processes, is based upon scientific principles, and the knowledge of those principles, the training in the application of them, constitute the safest guides for every trader, manufacturer or weaver.

In Japan the history of industry has been of a different kind. That now that home industry will more and more have to compete with foreign industry, <sup>now</sup> that it will have to satisfy a home consumption growing larger as the country grows richer, now that it is bound to look out for more customers in China, America and Europe, it must avail itself of that element which is at the bottom of all the rapid progress in Europe and America, that is knowledge. Modern industry firmly established itself on a scientific and certain basis, and all those who pursue a given industry, do not fail to learn what that foundation is.

Textile industry in Japan will also have to rely on such everlasting principles, in order to master all that has been done in Europe for this same industry. A school similar to those institutions in Guelph, Rautheingen, Lyons etc. can be of great assistance for such a purpose and give a mighty impulse. The instruction must be of a double kind, technical as well as commercial, of course not merely European, but making continual reference to and comparison with the textile industry in Japan. The purpose must be to open the road to progress by making enterprising Japanese

familiar with all the features of this most important industry at home and abroad, and by training people able to understand and to apply the technical improvements necessary for the success of commercial or industrial undertakings. The instruction has to be of such a kind that merchants as well as weavers will be equally interested in it. — No success is likely to be obtained, unless a certain number of traders, manufacturers and weavers can be convinced that a workshop of the above kind will be a useful institution. For its successful organization, private interest and intelligence ought to enter into collaboration with official care for the welfare of the people. For this reason, before deciding upon the institution of such a workshop, it appears advisable to hear the opinion of intelligent traders, manufacturers and weavers from the great centers of textile industry, say Kurie, Kyoto, Osaka, Tokyo, Makayama etc. In consultations and discussions with such persons a great amount of information and opinions will be collected. On such basis further steps may be taken.

However before calling such conferences, it may be useful to state once more the object of such deliberations.

The question is about the institution of a school-workshop for textile industry in Japan, the main

7.  
points of its organization being as follows:

- 1°. The school is intended for two classes of pupils, weavers or weaving masters, and merchants or manufacturers.
- 2°. The pupils of the first kind, <sup>professional</sup> ~~future~~ weavers, receive a thorough practical training completed by theoretical lectures on the mechanical principles of weaving and weaving implements, on the materials, on the various kinds of goods obtained, on the construction lasts one year, and only such pupils are admitted who already are familiar with the rudiments of weaving, and have been working as weavers. The school does not educate apprentices having no practice in weaving.
- 3°. The workshop contains a collection of the most improved handlooms of foreign construction, also all accessory machinery for the preliminary and finishing operations as far as such machinery can be moved by hand. If necessary, for the sake of comparison, it will also contain some Japanese looms.
- 4°. The head teacher who is to be a Foreigner, has to explain the various constructions in all their details and in such a manner that the pupils thoroughly understand the working of each mechanism, the reasons of such and such a construction, the advantages and disadvantages, and thus are enabled to understand each step to improvement, to perceive the merits and benefits of each construction, and to judge by themselves of what may be best suited for Japan.

5. The pupils learn the decomposition and recomposition of any kind of woven cloth, Japanese or foreign, made of one material or out of several mixed, and must be able to perform all the necessary operations from beginning to end, to set up the loom, and to weave the cloth themselves. As much as possible, the *ryūkyō* society for promoting or assisting this school, takes care that the cloth made by the pupils, can be sold, so that the pupils may receive a salary for their work.

6. *Sentences* are given on all the materials used for weaving in foreign countries as well as in Japan with the help of collections of such materials. For the instruction in Japanese materials as well as for the instruction in the use of Japanese looms, it will be advisable to have a Japanese teacher. The pupils also learn how to calculate the price of any cloth according to its composition.

7. The theoretical explanations and the practical demonstrations and exercises, are to be of such a kind that the pupils are able to direct or to perform them, unless any kind of <sup>manipulating</sup> ~~work~~ for the most economical production of any cloth of given composition and quality.

8. If amongst the implements of the school there are some, like the card-punching machine for Japanese looms, which may also be used by outside people, the school will undertake such work on command and against payment.

9. It would be a great advantage if the school could be provided with some motor, say a water-wheel, and a certain number of power looms for silk- or other goods. In this case another division of pupils would be trained in the working of these power looms, and in the same time would receive the necessary instruction for setting up smaller establishments with power looms, which most likely will soon ~~be~~ come into great favour with enterprising capitalists.

10. Another division of the pupils will be formed by those who in future may be at the head of some trading or manufacturing firms. Their education will be of a more theoretical kind than that of the other division. However the pupils will have enough practical training to understand perfectly well the handicrafts of weaving, and to know what manipulations, what looms are required for producing a given kind of cloth. They are made acquainted with the nature and value of the materials required, and are exercised in the calculation of the <sup>cost</sup> expenses of all kinds of ware. But they do not work on the looms against salary like the pupils of the other division.

11. The school is open at any time to visitors interested in the textile industry. According to circumstances, public lectures and demonstrations, are given; comparative experiments will be made in the



presence of weavers and manufacturers. In short, all measures will be taken to ascertain, with the collaboration of all competent people, through careful experiments and minute discussion, what improvements, what new implements might be adopted by Japanese industry. After having settled such technical questions, ~~then deliberations~~ those ~~deliberations~~ will held deliberations on the economical measures to be taken in order to introduce such improvements, all over the country, with the help of the pupils of the first division who will act as practical teachers. In short, the school workshop must be managed in such a way as to become the renbyo. Now, the meeting place of all efforts towards the technical as well as the commercial progress of the textile industry. Of course, this is the sake of time; but with steady perseverance and however small a step forward, every day, at the end it will make a long run.

12. It would be to the great benefit of Japanese industry, if a dying shop were connected with the school for weaving, chiefly in view of the gradual introduction into Japan of wool and woollen yarn. For this branch too, it would be advisable to engage a foreign teacher trained practically as well as theoretically in one of the special schools of Europe.

13. In the above prospect it has been recommended, to engage foreign teachers for weaving as well as for

being. This is much to be preferred to sending young  
 Japanese to Europe, in every respect practical as  
 well as economical. - There can be no doubt that the  
 arts of weaving and dyeing in Europe are considerably  
 in advance of the same arts of Japan, as far as the  
 fundamental and scientific principles are concerned.  
 Great may have been and still may be, the manual  
 skill and practical experience of Japanese weavers  
 and dyers; but the steady progress ~~depends~~ of the whole  
 of an industry depends on other elements than those  
 individual qualities. For the sake of rapid progress,  
 scientific knowledge has to combine with practical  
 experience. But in this respect, the superiority undoubtedly  
 is on the side of a well trained Foreigner. For whom  
 it will be easy enough to understand Japanese practice,  
 and to distinguish what is good and what is bad. He  
 will not shrug his shoulders at every thing Japanese,  
 but will try to know, and discern impartially. -  
 It is impossible that any young Japanese sent to Europe  
 for two or three years should come back with the  
 knowledge and experience required for the task of  
 managing a wool-workshop. - The plan to be adopted  
 would be to send to Europe the best pupils of the  
 school, to become teachers after their return if they  
 like; but this only after some years of industrial  
 practice in Japan.

14. Besides the training of the school workshop, there ought to be evening lectures given to the pupils, in mathematics, drawing and designing of machinery, elements of natural philosophy and chemistry etc. This can be done by outside people. In Europe such lectures are easily available in any town, and it would be a good thing if similar lectures were instituted in all the larger towns of Japan. Foreign languages would also form a subject of outside teaching.

15. As to the financial management of the school, it may be observed that in Europe all the pupils pay some fees. This system ought to be adapted in Japan too. It is much better to have only a small number of ~~big~~ <sup>able</sup> ambitious pupils who value instruction enough to pay for it, than to have a large number of non-paying pupils. This does not prevent from establishing free scholarships in exceptional cases.

So above is meant only to explain the main features and the object of such a school workshop. Further details must be the object of minute deliberation when such an institution will have been decided upon. It is much to be desired that such a plan should find favour with the manufacturers and weavers of some

of the great tactic centers. If properly managed the influence of such a school-workshop will extend far beyond its limits, not only as a place of teaching, but it may easily become the starting place and the center of a lively progressive movement through the combined efforts of all those interested in the same industry. Such association of similar interests is the most powerful engine of progress.

Toledo, 16<sup>th</sup> Aug. 18.

Wagener